حكومة رأس الخيمة
Government of Ras Al Khaimah

بلديـــــــة رأس الخيمـــــــــة
Ras Al Khaimah Municipality

مؤسسة إدارة المخلفات
Waste Management Agency

The Business Case for Waste Segregation in Middle Eastern Cities

A joint report by Ras Al Khaimah Municipality and Public Services Department - Waste Management Agency

November 2022

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Executive Summary

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- Waste management in the Middle East relies heavily on landfills. These cause several environmental and health problems, while taking up land where land value is increasing

- Many countries are minimising landfill use by adopting circular economy concepts such as recycling, composting and waste to energy. OECD* countries divert 55% of their waste away from landfill

- The first step towards circularity is segregation of waste and recycling of valuable segregated material. Segregation enables creation of high-value materials from waste, thus allowing higher diversion

- Cities should start gradually, mandating only one segregation category (recyclables) in the beginning. Starting segregation in this way is estimated to add between 15% and 25% to net waste management costs

- Domestic waste segregation may not be lucrative by itself in the Middle East, but is a necessary enabler of wider goals: public health, land value enhancement, water and soil preservation, sustainable tourism and emissions reduction

*OECD: Organisation for Economic Cooperation and Development, a group of 38 developed countries

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Current Situation & Global Benchmarks

Waste management in the Middle East relies heavily on landfills, taking up land where land value is increasing, while discarding valuable materials

WASTE DISPOSAL IN LANDFILL[2,3]

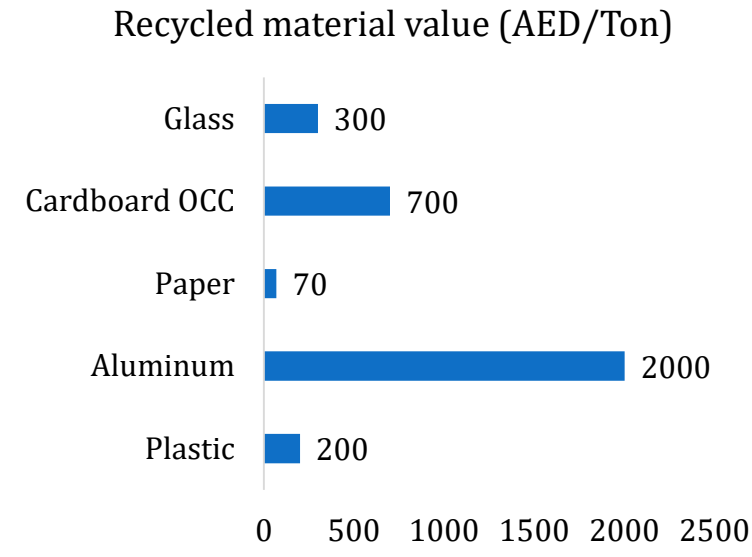
77% of all waste in the UAE

29 million tons per year

LANDFILL AREA[4]

840 hectares in the UAE

Market value of recycled material in the UAE[1]



Given the total waste quantities, the potential value of recycled material in the UAE or wider Middle East region is significant.

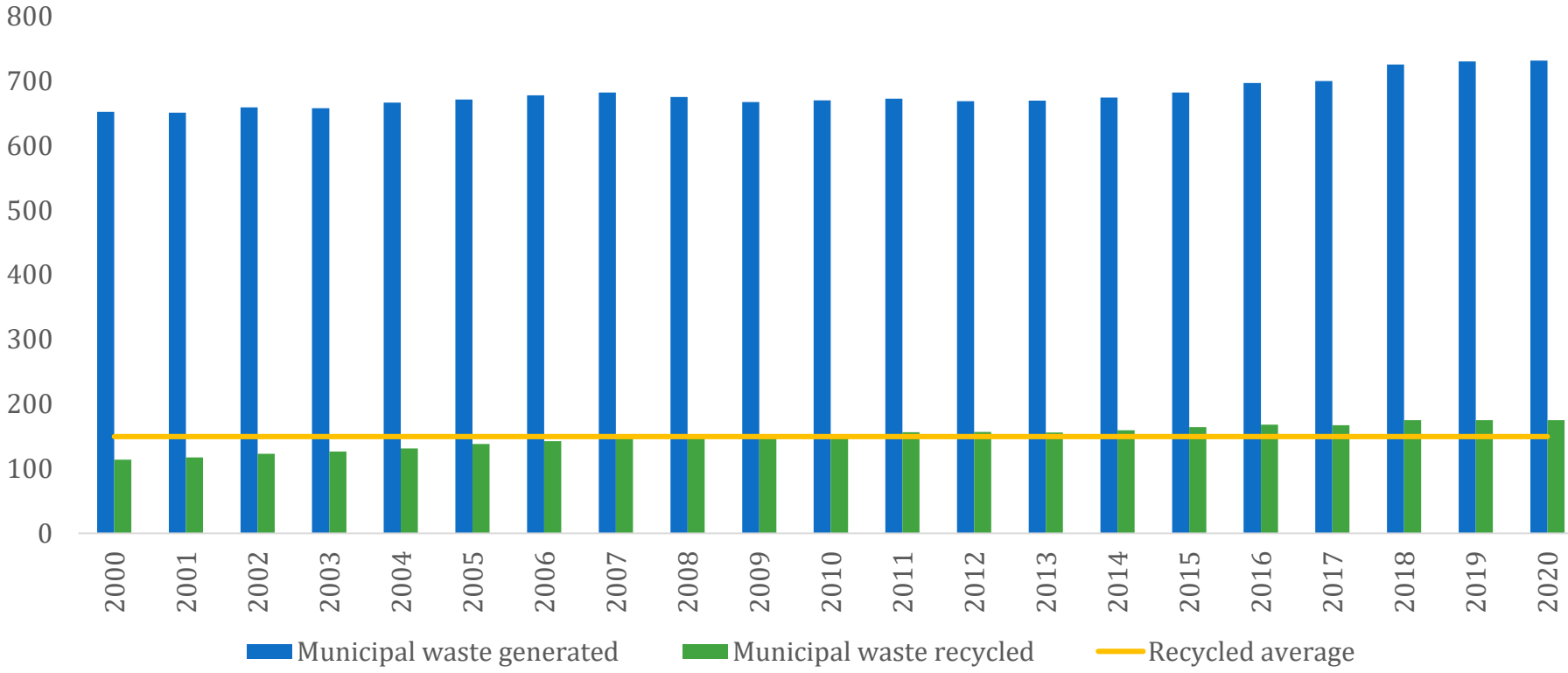
Landfills, if not managed properly, cause health, safety, environmental & economical externalities in the long term

Landfill Externalities	Description
 **Hazardous gases**	Uncontrolled release of gases from unprocessed waste products
 **Odour**	Odour generation from unprocessed waste
 **Water contamination**	Uncontrolled release of liquid leachates that seep into groundwater
 **Limits nearby developments**	Depletion of land value by constraining nearby developments, while also preventing construction on the landfill itself for many decades
 **Pests**	Attraction of pests and creation of a platform for diseases

Reducing waste disposal in landfill is the best way to prevent or reduce these externalities

OECD countries recycle 22% of their waste (valued at $16-18 bn/yr*) and divert ~50%, thus reducing land needs and environmental problems

MSW recovered through recycling[6]
OECD countries (tonnes, thousand)



*Assumption: Average value of recycled material: USD 110-120 per ton

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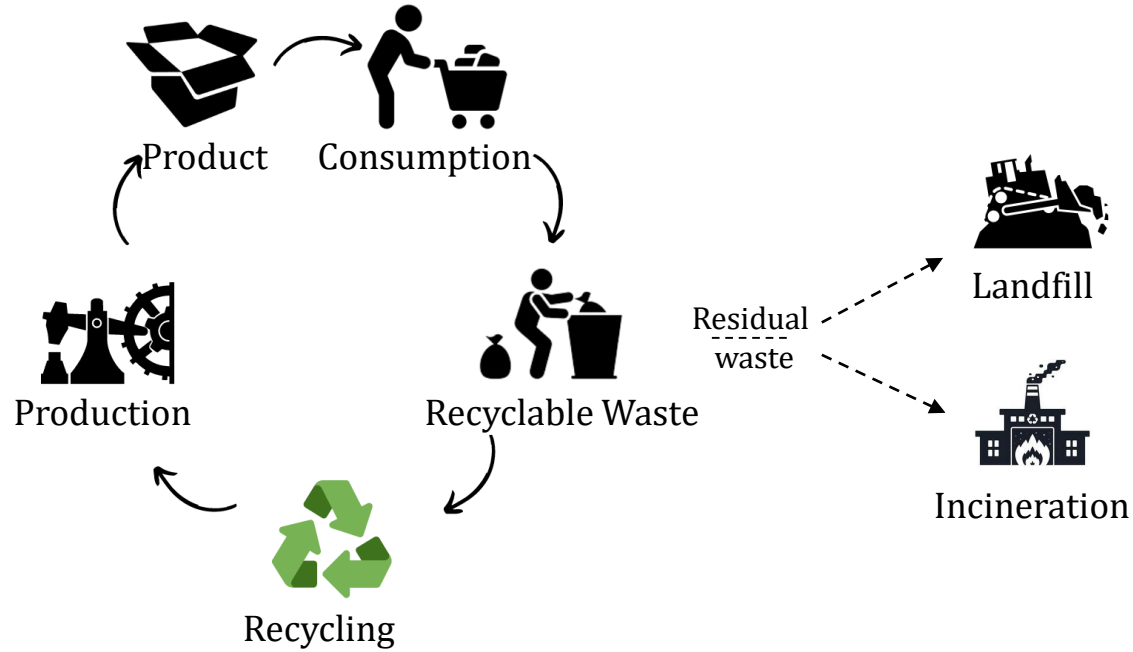
Circular Economy & Waste Segregation

Developed countries are adopting circular economy concepts to reduce waste disposal in landfill

Linear Paradigm

Circular Paradigm



Reaching the level of circularity of developed countries is a long-term regulatory and enforcement journey

Circular economy policies adopted by Germany & South Korea

Germany[7]

1972 — Waste Disposal Act

Assigns responsibility for avoidance, recycling, reuse and disposal of generated waste

1986 — Waste Avoidance and Management Act

Secure or restore of soil functions

2007 — Waste Shipment Act

Mandates inspection and issuance of permits for transportation of waste within the country

2019 — Packaging Act

To prevent or reduce the impact of packaging waste on the environment.

South Korea[8]

1986 — Waste Control Act

To prioritise waste management methodology based on waste type.

1995 — Volume-based disposal system

A Volume-Based Waste Fee (VBWF) policy to promote waste segregation & recycling

2005 — Food waste ban for Landfill

To restrict direct disposal of biodegradables into landfills

2018 — Framework Act

To derive a framework in order to achieve country's circular economy policy

A key enabler of circularity is proper segregation or separation of waste and recycling of valuable segregated material

Limitations of waste recovery from non-segregated waste[9]

Loss in efficiency and quality of materials

Recyclables must be manually extracted at the sorting facility, leading to extensive sorting, loss in efficiency and quality of materials

Mixing of non-recyclables with recyclables

Mixing of non-recyclables with recyclables in the same bin such as garbage bags, sanitary waste, packaging, general waste, food waste, hazardous waste, clinical waste, bulky waste, etc. downgrades waste recovery

Source-segregation initiatives

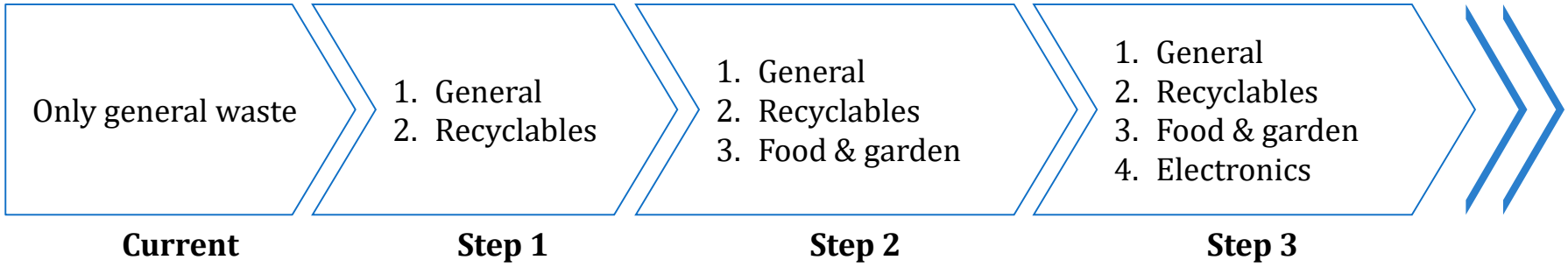
Germany[10] is considered a world leader in waste recovery. Waste from source is segregated and collected in several different categories, from the late 1990s

South Korea[11] is one of the non-EU countries leading in waste recovery. Waste is segregated and collected as general waste, food waste, recyclable items, or bulky items from early 2000s

Although post-collection separation has improved in recent years[13], source-segregation is still widely considered superior

A phased approach to implement segregation is the best practice globally

Steps to gradually reach comprehensive segregation of waste



Waste Management Municipal Initiatives - EU

2008

Waste Framework Directive

Establishes a waste hierarchy to set the framework for segregation

2012

Landfill Directive

Regulates the type of waste that can go to the landfill

2018

Waste Electrical and Electronic Equipment Directive (WEEED)

Establishes an obligation to collect WEEE separately for sorting and recycling

Source: click here

The Middle East could follow the example of more developed countries, starting gradually with only one segregation category (recyclables)

Step 1 – Segregated recyclables collection

Recyclables

Benefits of segregated waste collection:

- Increases recovery of quality materials
- Promotes appropriate disposal of general waste by preventing mixing of recyclables in it
- Limits and differentiates the type of waste ending up in landfill, hence prevents run-offs into the soil

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Cost-Benefits Assessment of Segregated Waste Collection

Source-segregation of 1 additional recyclables stream may cost 24% to 45% more, as a separate collection trip is needed for each segregated waste type

Analysis Inputs & Assumptions

Scenario assumptions	Conservative	Base	Aggressive
Waste generation rate (kg/day/person)	1.50	1.70	1.90
Segregation rate (%)	20%	25%	30%
Collection frequency per month (recyclables)	8	12	15

Case-specific assumptions for segregated collection

Collection shifts needed	1 shift
Collection frequency – general	Daily
Community type	300 villas, 5 pax/villa
Collection vehicle	Rear loader with multi-lift, 8 tons capacity

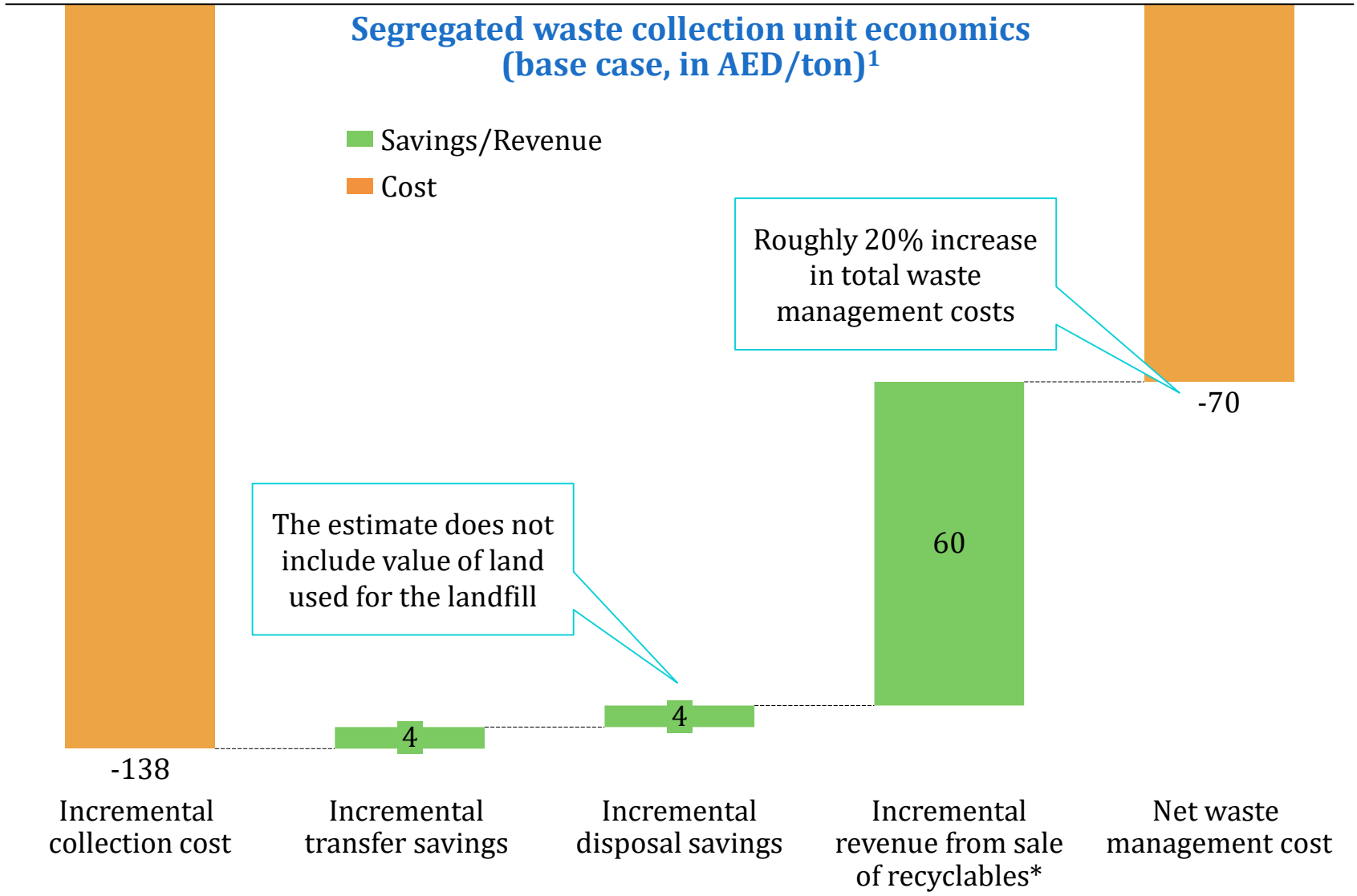
Additional collection cost for segregated collection of recyclables

24% - 45%

A source-segregated waste collection solution includes factors such as additional collection trips, staff and bins, that add to the cost

Source: RAK Public Services Dept. & Reem analysis

However, about half of the collection costs can be recovered through sale of valuable segregated recyclable material



* Compared to sale of only 10% of post-separated recyclables, in case of no segregation

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Conclusions

Domestic waste source-segregation is a long-term project requiring awareness activities, regulation and enforcement to succeed

Requirements for success of domestic waste source-segregation

- **Continuous Awareness Activities** through multiple channels, to ensure that segregation becomes socially desirable or “trending”
- **Regulation and enforcement,** including a system of incentives and penalties, to sufficiently encourage households to maintain the habit of segregation
- **Efficient waste collection operations,** to ensure that the city administration is technologically and operationally ready to receive additional waste streams and deal with exceptional cases in a professional and disciplined manner

Domestic waste segregation may be unprofitable by itself in the Middle East, but could be a necessary enabler of wider strategic goals

Strategic objectives supported by waste segregation and recycling

- **Public health and sanitation;** as segregation enables more appropriate treatment and handling of wet and organic waste as well, thus helping reduce pests and leakages
- **Protection of water and soil resources;** as less harmful chemicals (heavy metals, toxins, microplastics, etc.) are allowed to enter the soil and water
- **Enhancement of real estate value;** as less land is taken by the landfill and less odour is released
- **Sustainable tourism;** as tourists increasingly consider segregation as a core part of sustainability
- **GHG emissions reduction or net-zero emissions**; as less waste decomposes at landfills
- **Better possibilities for the remaining domestic general waste;** as additional sorting may enable composting, RDF production or fuel production from the remaining waste

A more complete policy case requires collaboration with government bodies responsible for public health, urban planning, tourism and environment

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References and Editorial Team

References

1. RAK Public Services Dept. & Reem analysis
2. https://global-recycling.info/archives/2623
3. https://www.vision2021.ae/en/national-agenda-2021/list/card/percentage-of-treated-waste-of-total-waste-generated
4. Reem analysis
5. https://www.scad.gov.ae/Release%20Documents/Waste%20Statistics_2019_Annual_Yearly_en.pdf
6. https://stats.oecd.org/viewhtml.aspx?datasetcode=MUNW&lang=en
7. https://www.iwm-nama.org/wp-content/uploads/2019/11/EN-Final_web-smaller_NAMA-Policy-Paper-EN.pdf
8. https://seoulsolution.kr/sites/default/files/policy/2%EA%B6%8C_10_Environment_Municipal%20Solid%20Waste%20Management.pdf
9. https://axil-is.com/waste-segregation/#:~:text=Failing%20to%20segregate%20trade%20waste,harmful%20gas%20into%20the%20atmosphere.
10. https://www.bmuv.de/en/topics/water-resources-waste/circular-economy/waste-policy
11. https://seoulsolution.kr/sites/default/files/policy/2%EA%B6%8C_10_Environment_Municipal%20Solid%20Waste%20Management.pdf
12. https://www.municipalwasteeurope.eu/summary-current-eu-waste-legislation
13. https://link.springer.com/article/10.1007/s10640-020-00457-6

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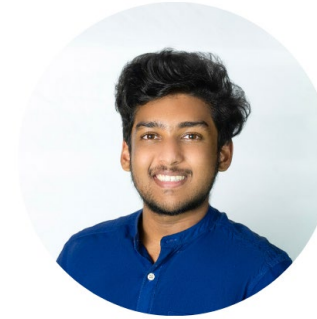

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