Plastic liners for the collection of SSO: odours, participation rates and compost or digestate quality

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Votre gouvernement

Québec

Outline

1. Composting and anaerobic digestion (AD) in Québec
2. Source separated organics (SSO) in plastic liners: current environmental requirements in Québec
3. Odours
4. Other environmental considerations
5. Conclusion

Composting and AD in Québec

- Growing since the 1980s and 90s
- Québec residual materials management policy
  - 1998 – 2008
  - 2011 – 2015 Plan d'action
  - 2019 – 2024 Plan d'action
- Ongoing objective: recycle 60% of organic residues

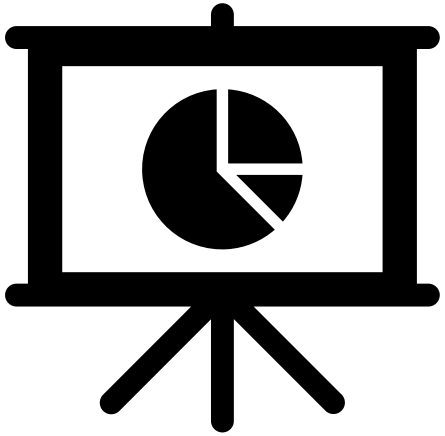
- Stratégie de valorisation de la matière organique 2020-2030

Stratégie de valorisation de la matière organique

- Divert organics from disposal
- Deploy collection and treatment infrastructures
- Main objective:
  - Recycle 70% of targeted organics by 2030
- 14 directions relying on:
  - Programs that support food and green waste management
  - Market stimulation pf digestate and compost and securing the existing industry
  - Creation of a new regulation to ensure sorting and recycling of food waste generated by industries, businesses and institutions

Preliminary results of the Strategy

- Incentives in place:
  - + $383M in composting and AD facilities as well as collection bins
  - + $70.4M in December 2023 in incentives through our main program for municipalities (annual subsidies)
  - + $11M Programs – ICI organics (through RECYC-QUÉBEC)
- Results (2022)
  - 81% of Québec's population lives in a community with an organics collection or composting/AD program.
    - (Preliminary results for 2023: 91%)
  - 37 composting or AD projects and tens of thousands of collection bins funded by the MELCCFP
  - + 12% increase in organics recycling rate over 3 years, up to 56%.
- Ongoing:
  - Regulation on ICI organics management (2026)
  - Increase in disposal charge (Jan. 2024=$32/ton; Jan. 2022 = $24.32/ton) Effect yet to be monitored.



Odour challenges in the 2000s

- Major challenges in the 2000s in the composting industry
- Among others, odours related to:
  - Biosolids
  - SSO collected in plastic liners
- Pressure from neighbours
- Site closures – Residues left behind
- Residue management paid for by the government

➢ Adoption of guidelines in 2008 (composting) and 2012 (AD) for the analysis of authorization appliances:
  - ➢ *Lignes directrices pour l'encadrement des activités de compostage*
  - ➢ *Lignes directrices pour l'encadrement des activités de biométhanisation*

Environmental requirements for SSO collected in liners

- Requirements related to facility capacity and odour category of the feedstocks, as defined by the guidelines.

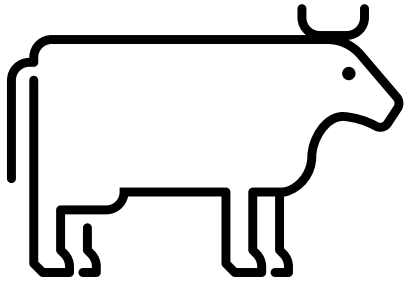
O1

Compost

Autumn leaves

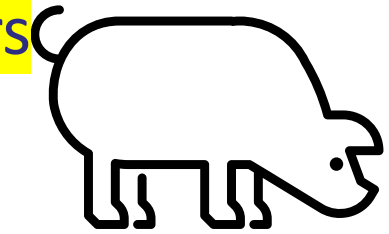
O2

Septic tank biosolids



O3

SSO – bulk or paper liners



OC

SSO – plastic liners, compostable or not

Slaughterhouse biosolids (primary treatment)

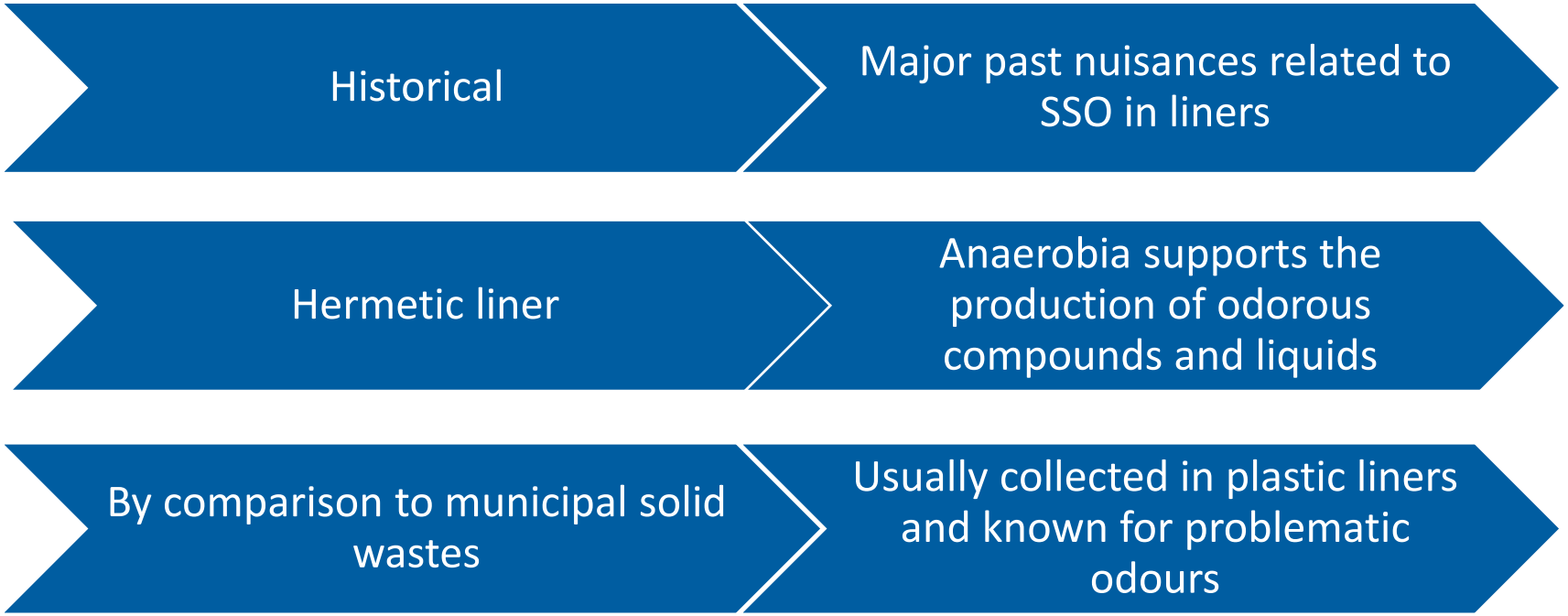
Domestic solid wastes

Environmental requirements for SSO collected in liners

- Receiving « OC » inputs must satisfy the following requirements:
  - Only possible on category 2 composting sites
  - Reception, conditioning and thermophilic composting inside a building with negative pressure and odour treatment
  - Curing, if outdoors, must be protected.

Environmental requirements for SSO collected in liners

- SSO collected in liners (compostable or not) are considered « OC » for the following reasons:



Why re-evaluate this position today?

- Controversial from the start
  - Citizens
  - City governments
  - Operators
- Several projects over the years have failed to demonstrate a significant difference regarding odours when comparing SSO collected in liners vs. bulk

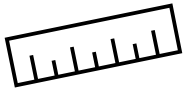
Documentation

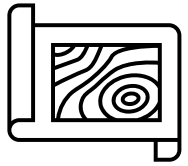
1. 2008 - 2022 : 14 years of application of the Guidelines
2. Solinov/RECYC-QUÉBEC/MELCCFP project
3. Panel tests
4. Discussion group
5. Other work
    1. Participation rates
    2. Plastics and foreign matter

2008 - 2022 : 14 years of application of the Guidelines

- Evaluate the guidelines' efficiency in terms of odour prevention
- Information compiled from authorizations issued
  - Active authorizations
  - Nuisance complaints filed with MELCCFP
- Data obtained for 47 facilities (composting and AD) in 14 regions

2008 - 2022 : 14 years of application of the Guidelines





- Principal criteria
  - Minimum setback distance
  - Odour management plan
  - Odour dispersion modelling
  - Liner
  - Windrows < 3 m
- Reasons for nuisance complaints received, mainly:
  - Proximity of neighbours
  - Type of composting process, operations or feedstocks differ from what had been authorized, or failure to follow general good practices
  - Building door left open
  - Equipment failure

Table 1. Probability (absolute number of facilities in parentheses) that at least one complaint was issued to the MELCCFP about a treatment facility, in relation with its respecting of main nuisance prevention criteria in the Guidelines.

Criteria	Meets criteria		Does not meet criteria		Significant ($\alpha = 0,1$)
	At least 1 complaint	No complaint	At least 1 complaint	No complaint	
a. Odour dispersion modelling	28% (7)	72% (18)	23% (5)	77% (17)	n.s.
b. Technical composting/AD specifications	23% (10)	77% (34)	67% (2)	33% (1)	n.s.
c. Odour management plan	23% (8)	77% (27)	33% (4)	67% (8)	n.s.
d. Minimal setback distances	17% (6)	83% (30)	55% (6)	45% (5)	**
e. Windrow height < 3m (composting only)	20% (6)	80% (24)	38% (3)	67% (5)	n.s.
Criteria a to d respected	21% (4)	79% (15)	29% (8)	71% (20)	n.s.
Criteria a to e respected (composting only)	7% (1)	93% (13)	33% (8)	67% (16)	*

[1] Odds ratio test

2008 - 2022 : 14 years of application of the Guidelines

- SSO collection in liners does not appear to be a critical factor in recent nuisance complaints for composting and AD sites in Québec

Solinov-RECYC-QUÉBEC-MELCCFP project

2 sites
- Turned windrows
- Aerated static piles

2 times
- Winter (food scraps)
- Summer (food scraps + yard waste)

Odours measured via olfactometry

SSO collected in compostable plastic liners vs bulk (no liners)

Collection with liners was not a critital factor in the measured emissions

Table 5.1. Statistical comparison of odour concentrations (olfactometry)

Site	Composting technology and stage	Season	Odour concentration, avg 3 measurements (uo/m3)		Student t-test[1]			
			SSO bulk	SSO liner	t_4	p	Différence	
Turned windrows	Feedstock unloading	Summer	28 857	21 199	1,94	0,12	No	
		Winter	2 300	2 345	0,11	0,92	No	
	Windrow T1 (rest)	Summer	34 336	40 005	0,28	0,79	No	
		Winter	22 747	30 342	1,16	0,31	No	
	Windrow T1 (turned)	Summer	47 503	62 285	0,73	0,51	No	
		Winter	27 015	28 070	0,63	0,56	No	
	Windrow T2 (rest)	Summer	5 732	6 936	1,27	0,27	No	
		Winter	25 550	36 112	1,06	0,35	No	
	Windrow T2 (turned)	Summer	75 685	11 677	4,20	0,01	Yes	Bulk > Liner
		Winter	16 549	28 634	4,35	0,01	Yes	Bulk < Liner
Aerated static piles	Feedstock unloading	Summer	13 505	22 903	5,99	0,00	Yes	Bulk < Liner
		Winter	362	1 861	8,36	0,00	Yes	Bulk < Liner
	Aerated static pile T1	Summer	37 775	95 182	4,10	0,01	Yes	Bulk < Liner
		Winter	41 692	25 517	4,55	0,01	Yes	Bulk > Liner
	Aerated static pile T2	Summer	26 230	20 380	0,78	0,48	No	
		Winter	7 810	6 762	0,44	0,68	No	

[1]Student t-test performed on $\log_{10}$ odour concentrations; $\alpha = 0.05$

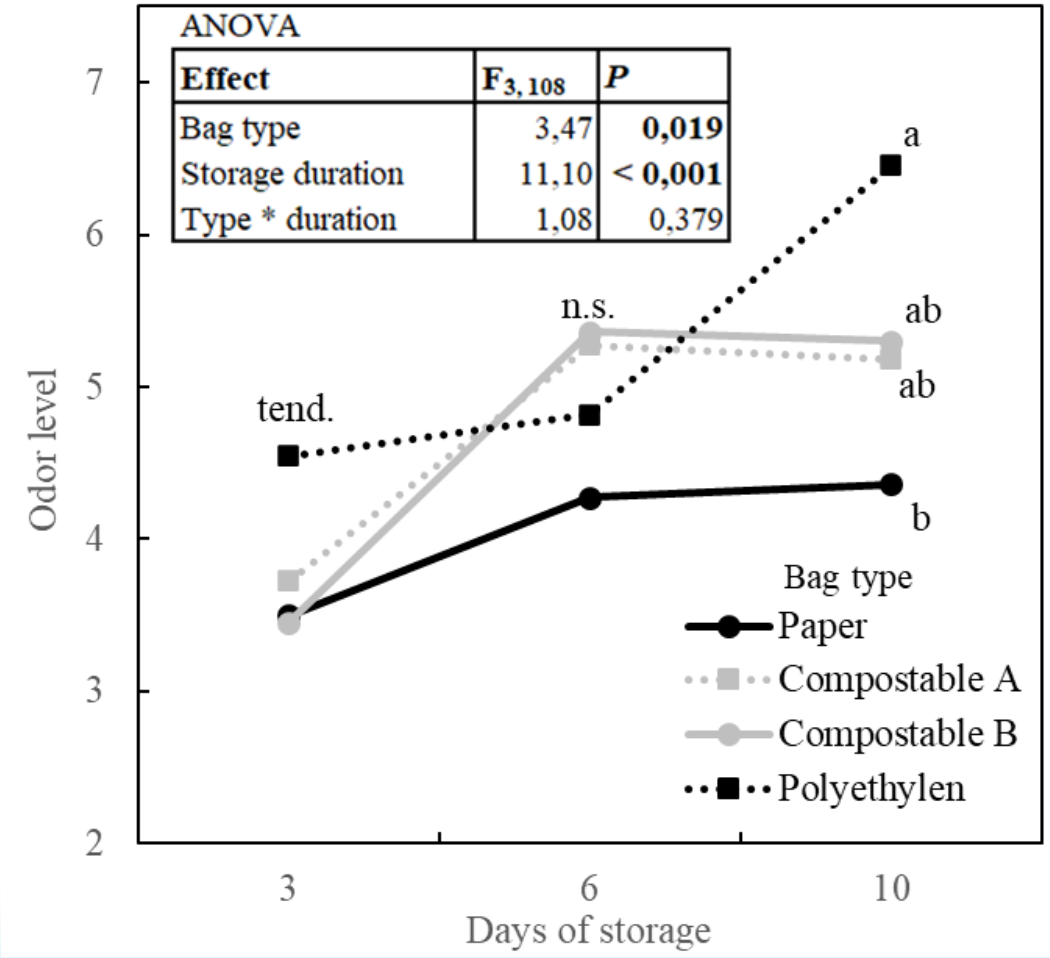
Urtnowski-Morin, C. & Forcier, F. 2021. Étude sur les émissions d'odeurs liées au compostage des résidus alimentaires collectés en sacs compostables. Solinov. 94 p.
https://www.recyc-quebec.gouv.qc.ca/sites/default/files/documents/etude-emissions-odeurs-compostage-sacs.pdf
(table 5.1 translated with permission from Solinov)

Evaluation by panel (2015)

- In collaboration with CCC
- Methods:
  - Organic residues in liners, standardized recipe
  - 4 types of liners:
    - 1 paper
    - 2 certified compostable plastic liners
    - 1 polyethylene
  - Stored for 3 to 10 days
  - 11 panelists

★Thanks to CCC and all panelists! ★

Evaluation by panel (2015) – Results



2022–2023 discussion group

- 11 participants: 1 professional association, 3 public operators, 2 private operators, 1 composting consultant, 1 odour consultant, 1 researcher, CCC and RECYC-QUÉBEC

  ★Thank you all! ★
- Objectives:
  - Re-evaluate the environmental requirements for the management of SSO collected in plastic liners
  - Gather Québec's expertise in organics recycling specific to SSO management
  - Keep a broad view of the subject, more than just odours

2022–2023 discussion group

- Conclusions
  - Consensus: Odours emanating from SSO collected in plastic liners can be managed outside a building, without posing a greater nuisance risk than bulk SSO, when best management practices in composting are implemented. SSO in liners nevertheless have an odour *potential* greater than bulk SSO.
    - Principal risk factor identified: transit duration in transport trucks
  - Other challenges:
    - Liner contribution to fostering participation rates
    - Compost and digestate contamination (foreign matter)
    - Process complexification (conditioning, screening…)
    - Citizen confusion with respect to compostables

Outside Québec

- QC appears to have somewhat average environmental requirements regarding composting
- QC appears to be the only jurisdiction to distinguish SSO collection in liners vs. bulk and to associate this distinction with a closed building/odour treatment requirement
- However:
  - The plastic liner is identified as a factor that can increase odours by some jurisdictions
    - Examples: Ontario, UK
  - The plastic liner is identified as a contamination source for compost
    - Example: Vancouver area

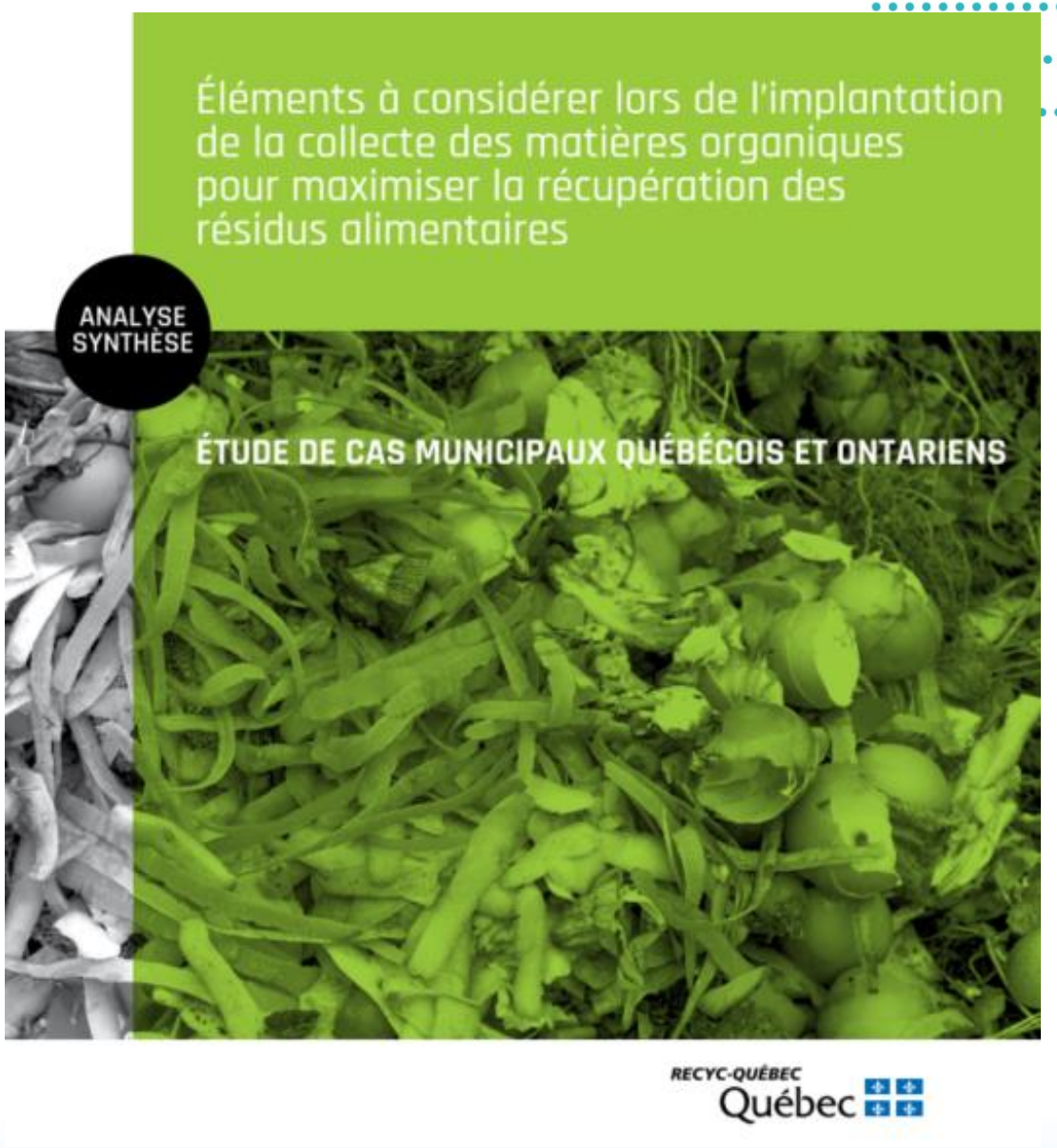
Participation rates

- The compostable plastic liner is generally considered to foster participation by citizens and ICI buildings
- Studies/reports are however scarce…
  - RECYC-QUÉBEC, 2015 Pratiques favorisant la récupération des matières organiques dans les industries, commerces et institutions (ICI)
  - WRAP 2021: Household food waste collections guide
  - Giroux, L., et al. (2023). The role, management, and impacts of plastics in organic waste diversion programs in Canada, ECCC
  - CIC 2017 (Consorzio Italiano Compostatori), Italian composting and biogas association – Annual report on biowaste recycling
    - Centemero et al. 2024. Italy's Experience with compostable plastics in organics recycling. Biocycle. https://www.biocycle.net/italy-compostable-plastics/
  - European composting network. 2019. Position Paper on the Acceptance of Compostable Plastics

Participation rates

- In Québec and Ontario, in single-family houses and in plex dwellings, plastic liners are not a critical factor for participation rates.
- Study based on quantitative and qualitative data.

Gravel, M.-H., et al. (2014). Analyse synthèse des éléments à considérer lors de l'implantation de la collecte des matières organiques pour maximiser la récupération des résidus alimentaires - Étude de cas municipaux québécois et ontariens. RECYC-QUÉBEC. 25 p.



Other work - odours

- To our knowledge, there is nothing that specifically compares odours between SSO collected in liners and bulk collection. This distinction is seldom apparent elsewhere.
- Even in reports specific to odour risks related to feedstocks, the comparison is not made:
  - Australian report: *Critical Evaluation of Composting Operations and Feedstock Suitability, Phase 1 – Odour Issues*
  - WRAP 2021: Household food waste collections guide

Feedstocks contamination

- Liner fragmentation into microplastics during treatment is mentioned by some authors:
  - Forberger J. and R. Freitag (2023) Biodegradable liners for organic waste recycling
  - US EPA (2021). Emerging Issues in Food Waste Management: Plastic Contamination.
- Others note an improvement in the handling and sorting performed by citizens and reduction in feedstocks contamination by foreign matter when plastic liners are allowed/distributed
  - European Compost Network. 2021. Position paper – Plastics, Microplastics in Compost and Digestate
  - Consorzio Italiano Compostatori. 2017. Italian composting and biogas association – Annual report on biowaste recycling

Conclusion

Odours

- When best management practices are implemented
- Collection in compostable plastic liners: a minor contributor to odour nuisance at treatment facilities

Participation rate

- Mitigated effect in plex dwellings and single-family houses
- Arguable effect in ICI and multi-unit buildings

Contamination (feedstocks and compost/digestate)

- Liner fragmentation into microplastics
- Effect on handling/sorting by citizens
- Citizen confusion: compostable vs. non-compostable
- Complicated operations at treatment sites

Votre gouvernement

Québec