









DECENTRALIZED COMPOSTING:

COMPOSTING WHERE THE BIO-WASTE IS GENERATED

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CirBioWaste - October 9th 2026

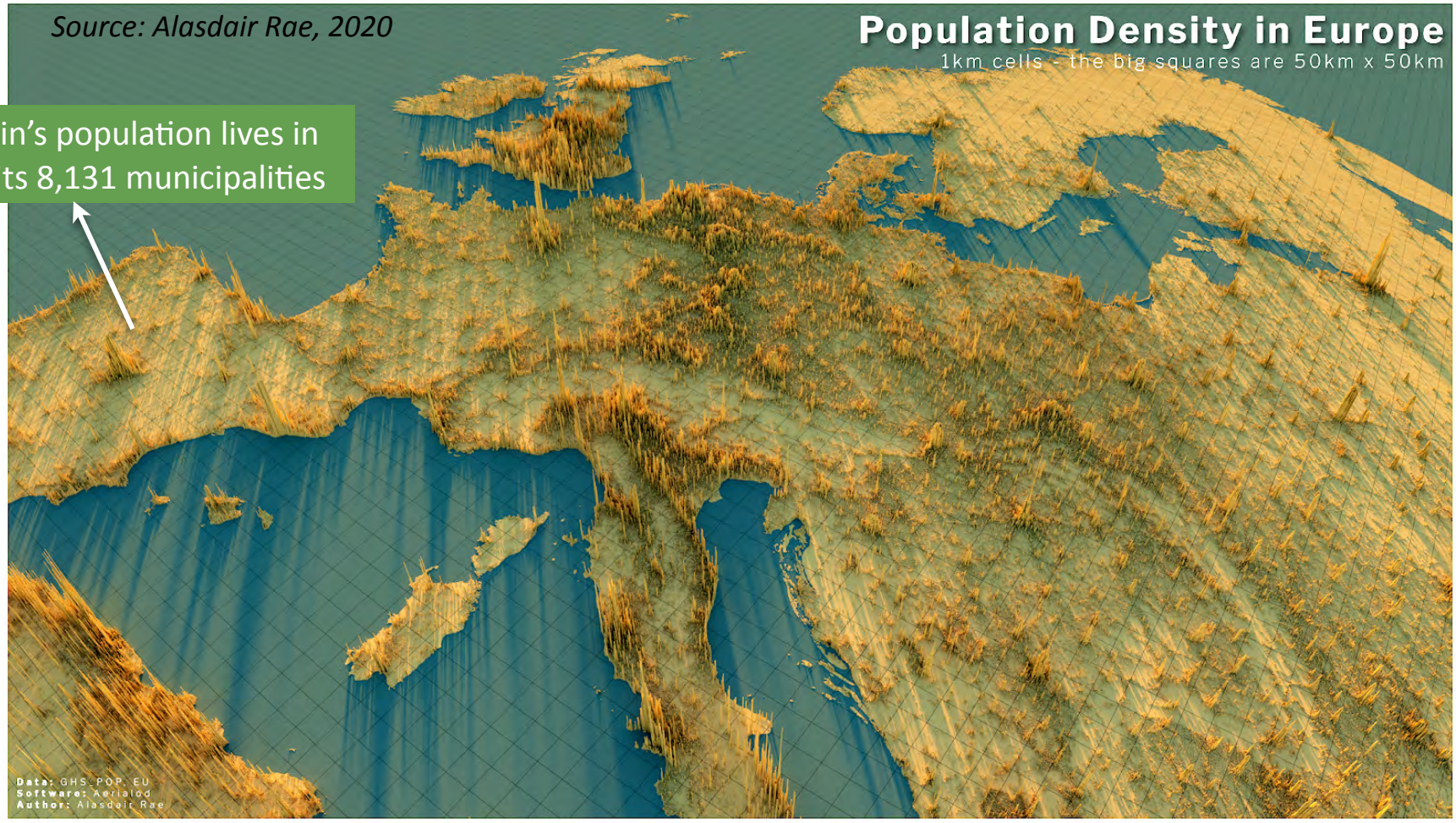
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Waste is generated where people live



Source: Alasdair Rae, 2020

50% of Spain's population lives in just 125 of its 8,131 municipalities



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Decentralised local composting



Both community composting and home composting are viable options for managing biowaste in many specific areas or even across entire territories, as an **exclusive management model** for this waste stream.



Community and household composting have <u>other applications</u>:

- As a **complementary system** to models based on collection and transport.
- As a **system associated with the management of specific large generators**.
- As a **system focused on training, education and awareness-raising**, etc.

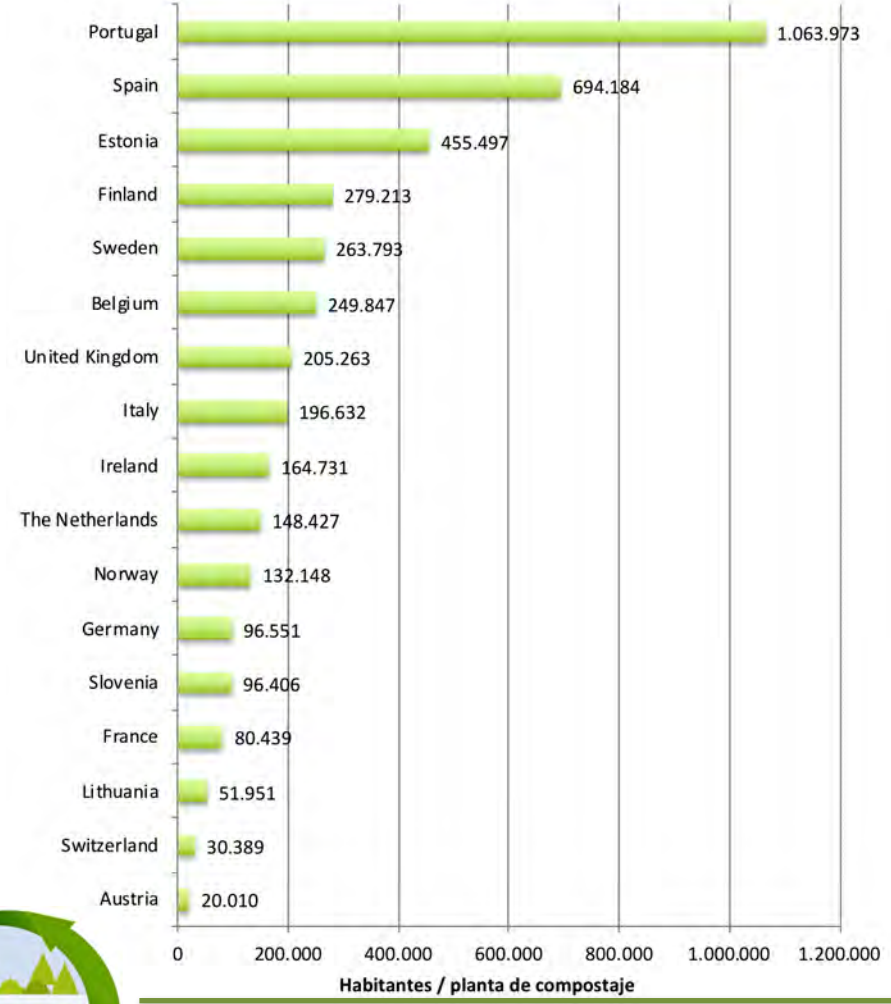


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How widespread are composting plants in Europe?







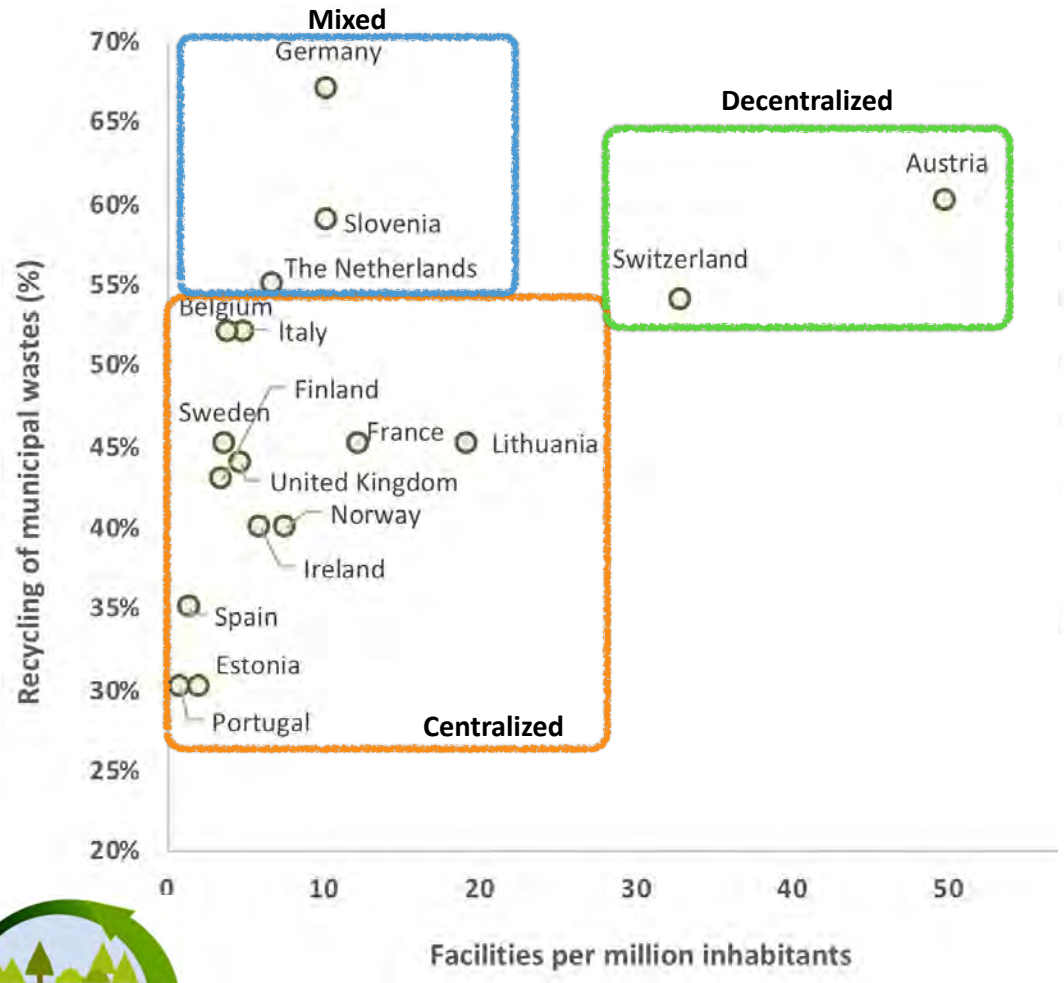
Source: ECN, Eurostat, ADEME and own data

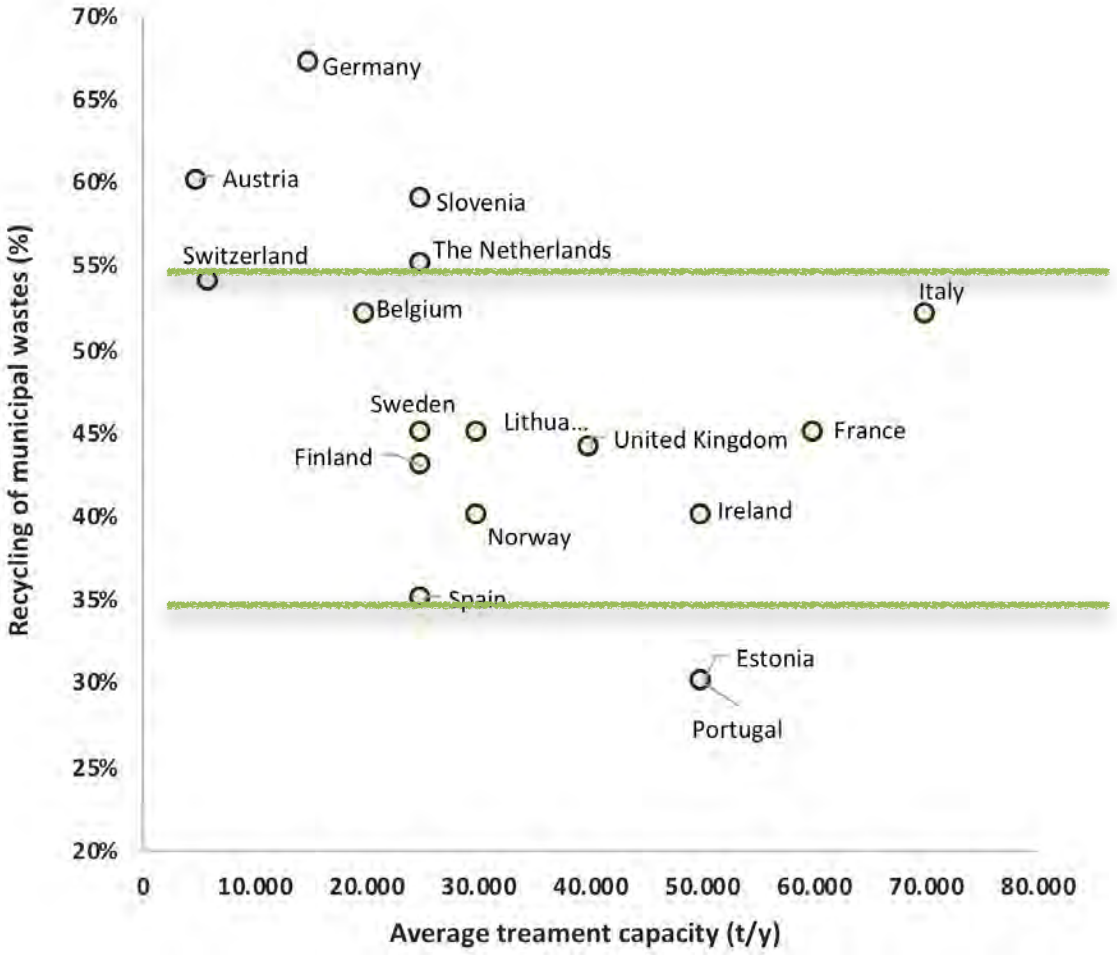
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The concept of the plant and the territory







Source: ECN, Eurostat, ADEME and own data

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Decentralised composting in Europe





Source: ECN, Eurostat, ADEME and own data

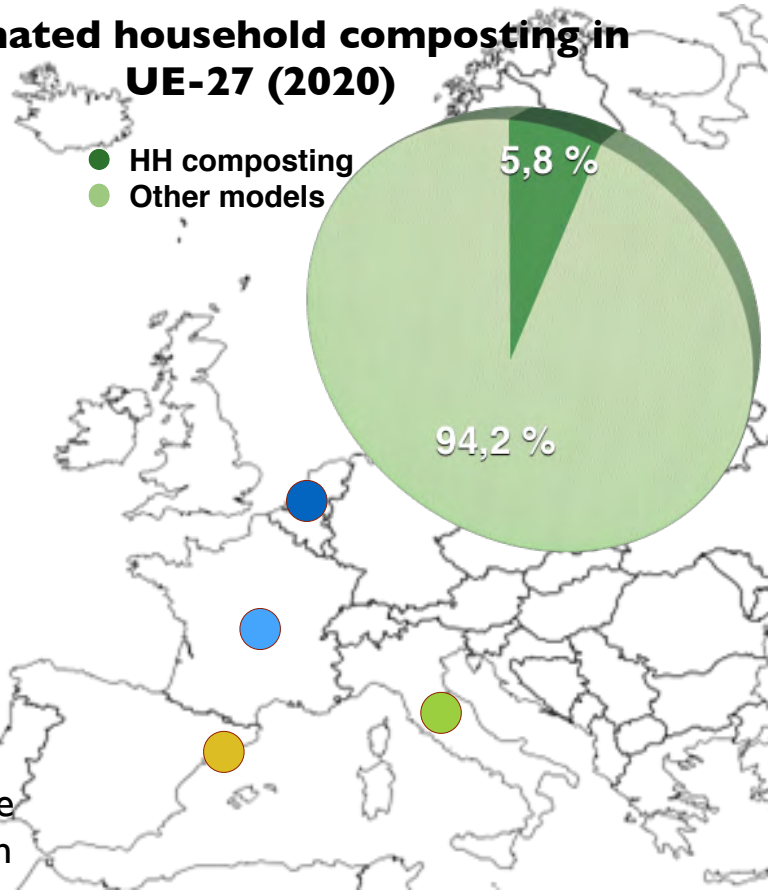
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Quantifying decentralised composting in Europe



Estimated household composting in UE-27 (2020)



Food Waste + Green Waste

Biowaste accounted for

Food Waste only

- Catalonia *~1,4 %*
- Italy *4,1 %*
- Flanders *9,8 %*
- France *14,6 %*

Administrative / modelled

Estimation method

Surveys + waste characterisation

Sources: ARC (2024), Municipal Waste Statistics – Catalonia; ISPRA (2025), Rapporto Rifiuti Urbani; OVAM (2026), Monitor Voedselverlies 2023; SDES/ADEME (2026), Déchets et gaspillage alimentaires en France en 2024; JRC, 2020

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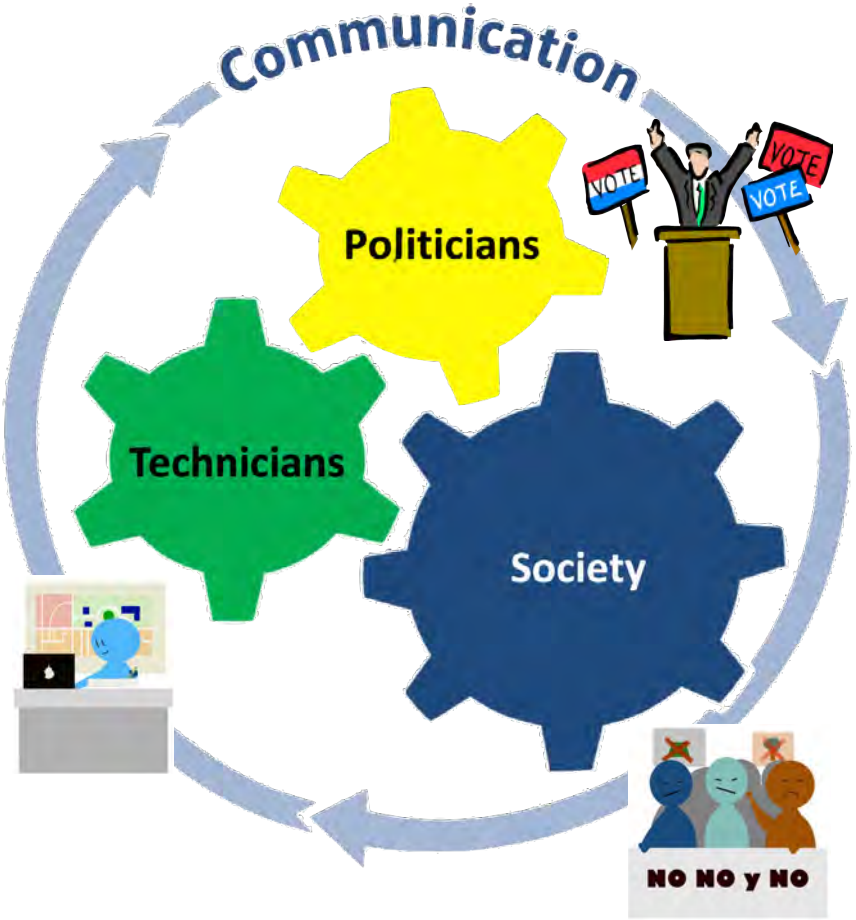
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Which approach is best suited to my territory?



IT DEPENDS OF:

- Need of **LOCAL employment.**
- Willingness **to create services**.
- **Social and territorial policy.**
- **Geographical** distribution.
- **Bio-waste quality.**
- Existence of **equipment and local facilities**.
- …..



- Austrian model?
- French model?
- Catalonian model?
- Pontevedra model?
- Flemish model?
- Ljubljana model?
- …..

NO

MODELS ADAPTED TO EACH TERRITORY

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Key elements of the local treatment model



The effectiveness of any separate waste management model depends on several elements that **must always be part of a long-term strategy.**



- ☑ Development of a regulatory framework - municipal ordinances.
- ☑ Environmental education and public awareness-raising to encourage participation <=> communication <=> information.
- ☑ Development of technical tools for service operation, monitoring and continuous improvement, including performance indicators.
- ☑ Introduction of financial or in-kind incentives (e.g. waste fee discounts, tickets to local events, prize draws featuring local products, discounts at local shops) and/or environmental taxation measures linked to participation, with the ultimate goal of implementing pay-as-you-throw (PAYT) schemes.

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The key factors in community composting



SOCIAL

Participation
Confidence
Transparency

DESIGN

Location
Dimensioning
Common elements
Further elements

COMPOST QUALITY

Parameters
Frequency of analysis



TRACEABILITY

Batchs
Parameters
Measurement of bio-waste treated

TECHNICAL

Type of composters
Bulking material
Operational model

TRAINING

Professional master composters
Volunteers

MONITORING

Monitoring visits
Maintenance visits

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Quality of community compost

Class	Potential use
A++	Organic agriculture. Use as fertilizer
A+	Organic agriculture. Use as fertilizer
A	Organic agriculture. Organic amendmer
B++	Agriculture and horticulture
B+	Agriculture and horticulture
B	Agriculture and horticulture
C+	Fruit growing - gardening - forestry
C	Fruit growing - gardening - forestry
D	Gardening - forestry
E	No feeding cultures

Source: Saha et al, 2010; Puyuelo et al, 2019; Arizmendiarrieta, 2024




Spanish Journal of Agricultural Research
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OPEN ACCESS

RESEARCH ARTICLE

Quality assessment of composts officially registered as organic fertilisers in Spain

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[1]Fertile Auro Association, 36211 Vigo, Spain. [2]Luar Environmental Consultancy, Euskadi, Spain. [3]Public University of Navarre, Dept. Agronomy, Biotechnology and Food, 31006 Pamplona-Iruña (Navarre), Spain. [4]Organic Wastes Management Consultancy, 08027 Barcelona, Spain.

Abstract

Composting of organic wastes is a management strategy linked to circular economy models through the transformation of these wastes into an organic product, compost, which can be used as fertiliser, soil amendment or growing media. However, the concept of 'compost quality' is not enough defined to take a technical decision about which is its best use or application. In the last decade, different guidelines and regulations about organic fertilisers have been developed. For instance, in Spain the Fertilisers Regulation categorises compost under five kinds according to the raw materials used – organic amendment compost (OaC), manure compost (MaC), green compost (GrC), vermicompost (VC), 'alperujo' compost (AlC) –, and under three quality levels (A, B or C) depending exclusively on the heavy metals content. This work analyses the national database of all composts (307) marketed in Spain, considering the analytical parameters declared, with the objective of proposing a methodology to define a global quality index. For this assessment, two indicators are employed: a fertility indicator, related to the nutrients content, and a clean indicator, related to the heavy metals content. Results show an average compost formulation 2.5:2.5:2.5 ($N:P_2O_5:K_2O$). MaC and OaC present the highest fertility indicator, whereas VC the lowest. Regarding the clean indicator, GrC, MaC and VC are cleaner than OaC. In the future, this new quality assessment should be completed by including other indicators related to physical and biological characteristic (*e.g.* porosity, stability/maturity, phytotoxicity) that could determine the most proper use of compost.

Additional keywords: compost quality; heavy metals; macronutrients; maturity; fertility indicator; clean indicator.

Abbreviations used: AlC (Alperujo Compost); CI (Clean Indicator); EWC (European Waste Code); FI (Fertility Indicator); GrC (Green Compost); MaC (Manure Compost); MITECO (Ministerio Transición Ecológica); OaC (Organic amendment Compost); RD (Real Decreto/Royal Decree); TOC (Total Organic Carbon); Wi (Weighing factor).

Authors' contributions: Conceived, designed and performed the experiments: BP, JSA and RP. Analyzed the data: BP and JSA. Contributed reagents/materials/analysis tools: II and BP. Wrote the paper: RP, BP and II. All authors read and approved the final manuscript.



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LOCAL COMPOSTING IN DIFFERENT CONTEXTS (SPAIN)

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Plan Revitaliza (Pontevedra)



revitaliza

É a hora da
orgánica!



Pontevedra (Galicia) – *Plan Revitaliza*

- > 8,000 home composters

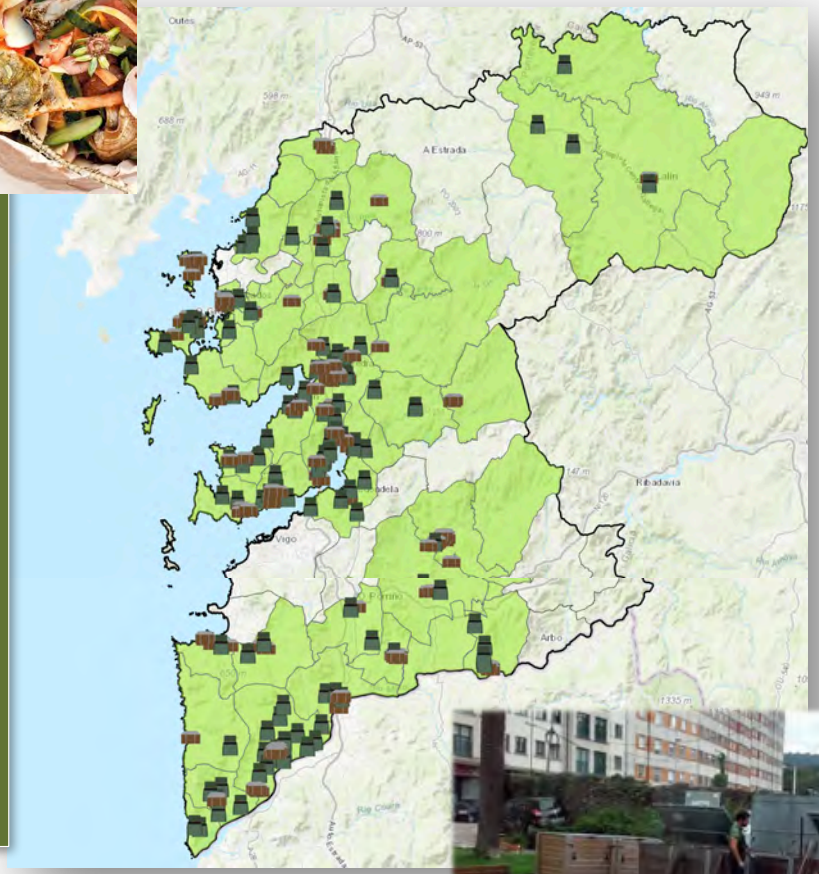
- > 300 community composting sites (1,376 composting units installed)

- 37 municipalities with community composting (47 municipalities participating in the programme)

- Total treatment capacity: ≈ 4,000 tonnes·year^{-1}

- Agrocomposting systems linked to agricultural cooperatives (e.g. *Martín Códax*, a major regional wine cooperative integrating winery residues and municipal biowaste)

- Technical training: more than 60 specialised professionals trained, covering operational, regulatory and communication aspects





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Plan Revitaliza (Pontevedra)



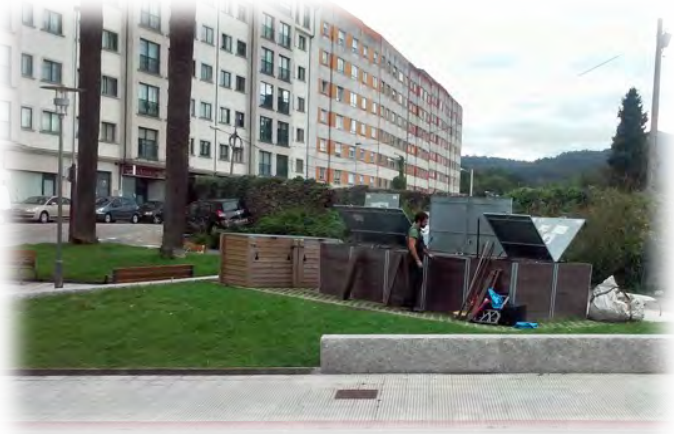












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Plan Revitaliza (Pontevedra) - Other considerations





Costs are based on actual operational data under optimal conditions

≈165–170 €·t^{-1} BW composted



Estimated savings: ≈ 110–115 €·t^{-1}

Conventional system (reference)

≈ 280 €·t^{-1} (collection, transportation and treatment)

Operating costs

- 90 % personnel
- < 10 % consumables



Additional costs:

- Bulking agent: ≈ 70 €·t-1
- Depreciation: ≈ 15–20 €·t-1



Rafa Domínguez visibiliza su rechazo a los composteros subiéndose a uno con un pico en la mano

El candidato del PP en Pontevedra se comprometió a eliminar todos los recipientes donde se hace compost comunitario en la ciudad

CEDIDA POR EL PP

MARÍA HERMIDA (/FIRMAS/MARIA-HERMIDA)
PONTEVEDRA 19/05/2019 21:37 H

Key vulnerability



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Rioja Alavesa (Spain): a hybrid model for biowaste management

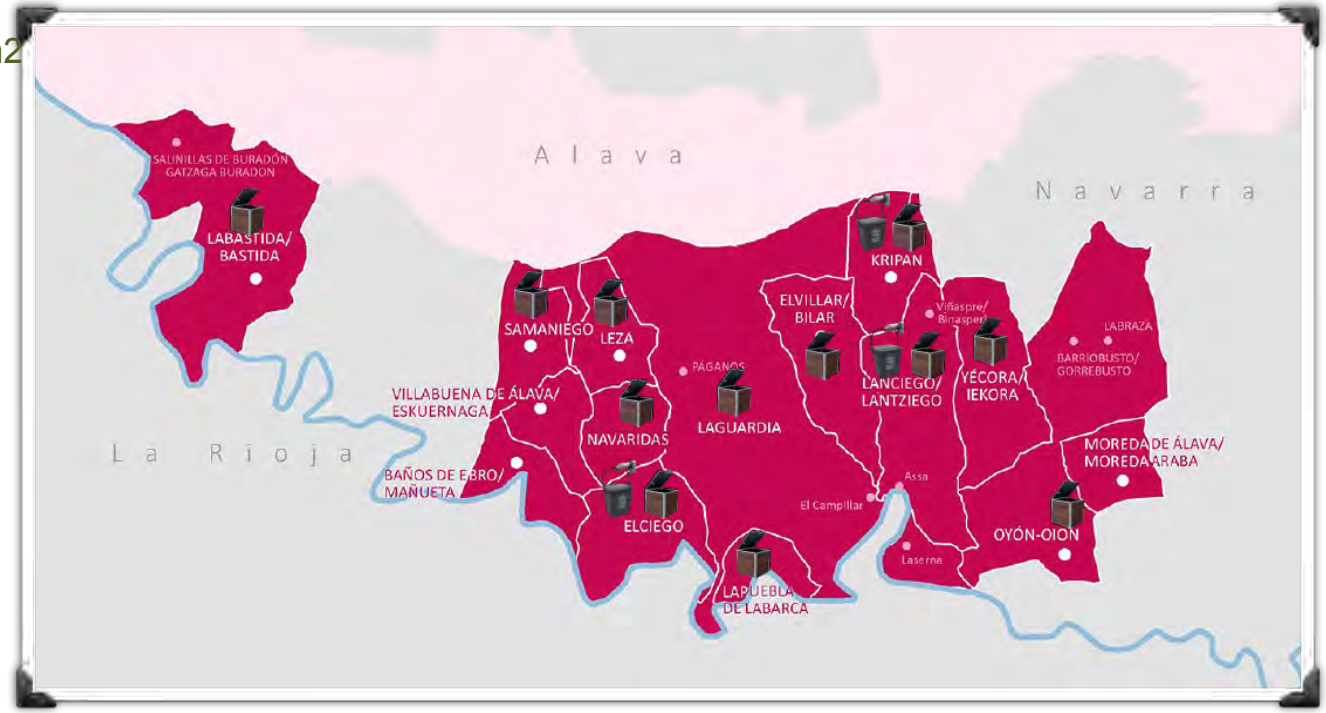


In recent years, models combining the separate collection of the organic fraction of municipal waste (OFMSW) with local composting have been developed. This is the case of Cuadrilla de Laguardia–Rioja Alavesa (Basque Country).

Territory
Dispersed population: ~11,200 inhabitants over 316 km2
15 municipalities and 23 population centres.

High seasonality:
- Presence of second homes.
- Significant tourism activity

Main economic activities:
- Vine growing
- Wine industry



Mixed context: low population density with the presence of large generators.

Source: Cuadrilla de Laguardia Rioja Alavesa, Municipality of Kripan, 2022)

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Kripan (Rioja Alavesa)



VOLUNTARY

Household composting

Community composting



MANDATORY

Separate biowaste collection (door-to-door, 2 days·week^{-1})

Identified bins (TAG) – data uploaded in real time.







Source: Cuadrilla de Laguardia Rioja Alavesa, Municipality of Kripan, 2022)

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Community composting in Rioja Alavesa















Source: Cuadrilla de Laguardia Rioja Alavesa, Municipality of Kripan, 2022)

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Mini-facilites and contingency points







- Composting modules (10 m^3)
- Elevated bulking agent container
- Information panel
- Contingency drop-off area
- Management area for collected biowaste

Source: Cuadrilla de Laguardia Rioja Alavesa, Municipality of Kripan, 2022)

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Integration of large generators: Marqués de Riscal





A significant HORECA complex integrated into the local composting model:

- 5-star hotel and winery complex.
- Several restaurants, cafés and event/catering services.
- A significant and highly concentrated biowaste generator.
- Integration into the same local management model used across the territory.

A demanding test for the model — and a highly visible showcase of what local composting can achieve

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Results of the model (Rioja Alavesa)



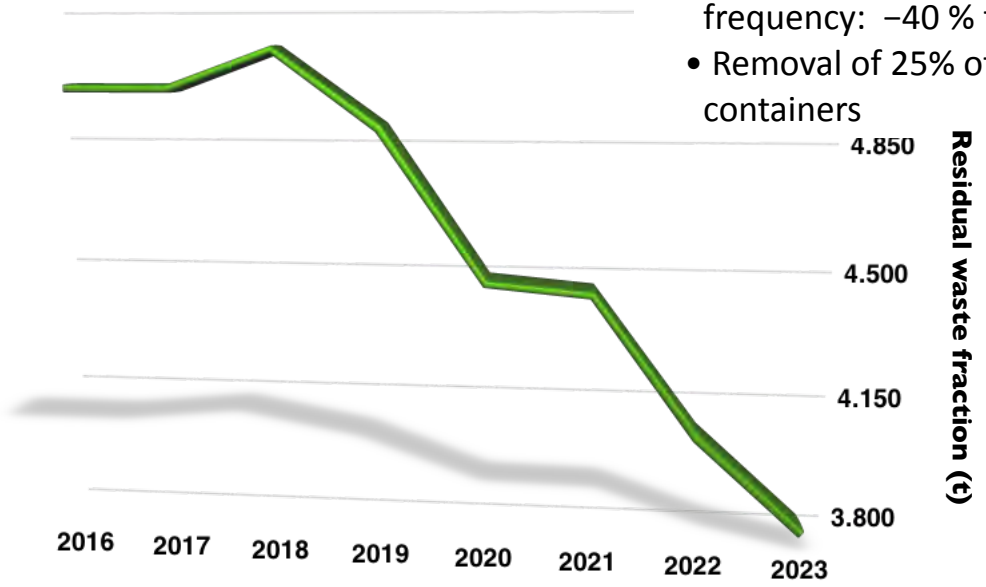
Collection improvement:

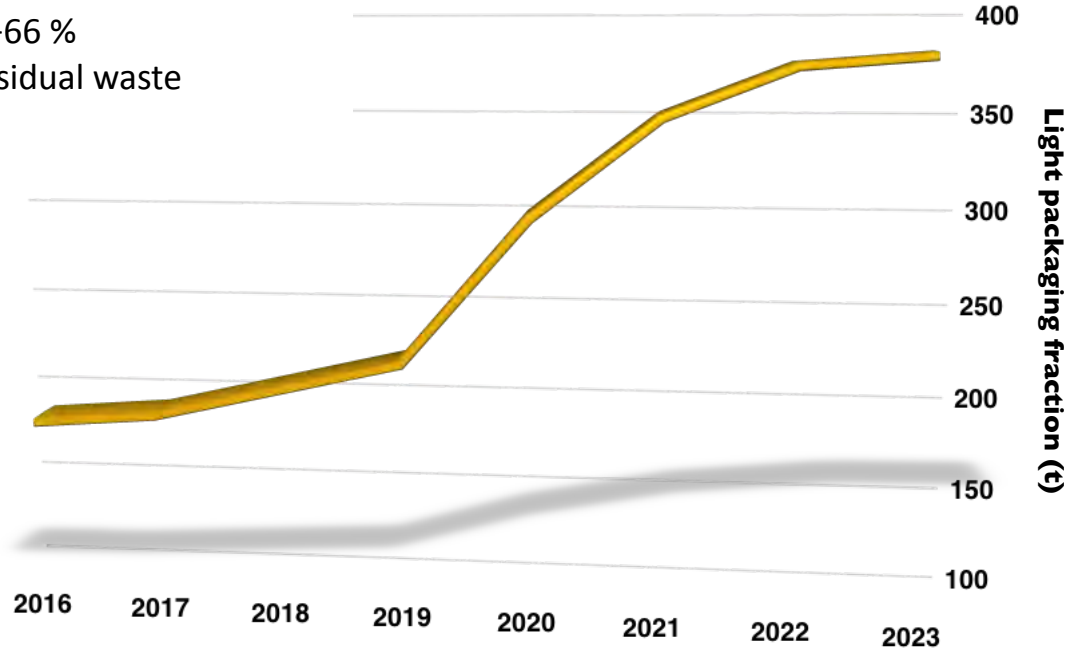
- Residual waste fraction:
  - from 12,79 to 4,82 kg/inhab·month
  - −62 %

System efficiency:

- Collection using an electric vehicle
- Reduction in residual waste collection frequency: −40 % to −66 %
- Removal of 25% of residual waste containers

- Light packaging:
  - from 2,43 to 3,17 kg/inhab·month
  - +30 %





Source: Cuadrilla de Laguardia Rioja Alavesa, Municipality of Kripan, 2022)

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Results of the model (Rioja Alavesa)



Biowaste quality

- <1% impurities in collection and composting
- Impurities virtually absent in the final compost

Capture and operation

- 4.15 kg/inhabitant·month of residual waste (Kripan, April)
- 12 tonnes collected in 6 months

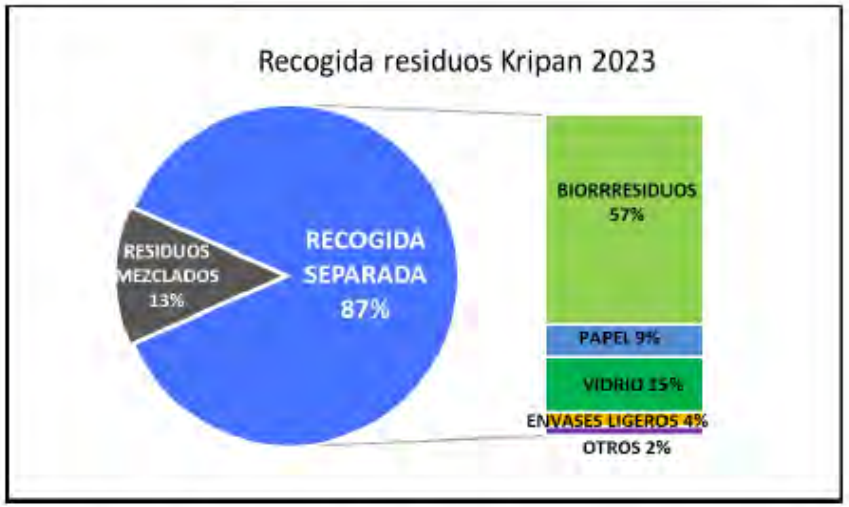
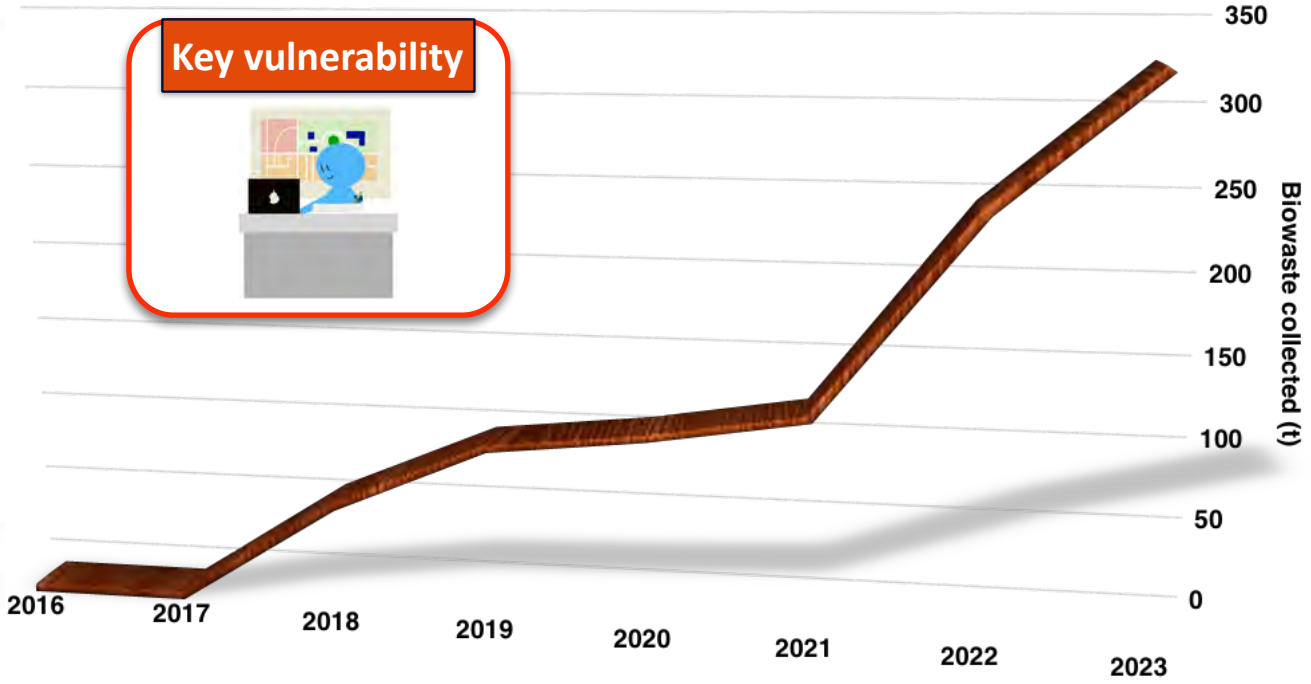


Gráfico 42.b. Porcentaje de cada sistema de recogida (% en peso).



Source: Cuadrilla de Laguardia Rioja Alavesa, Municipality of Kripan, 2022)

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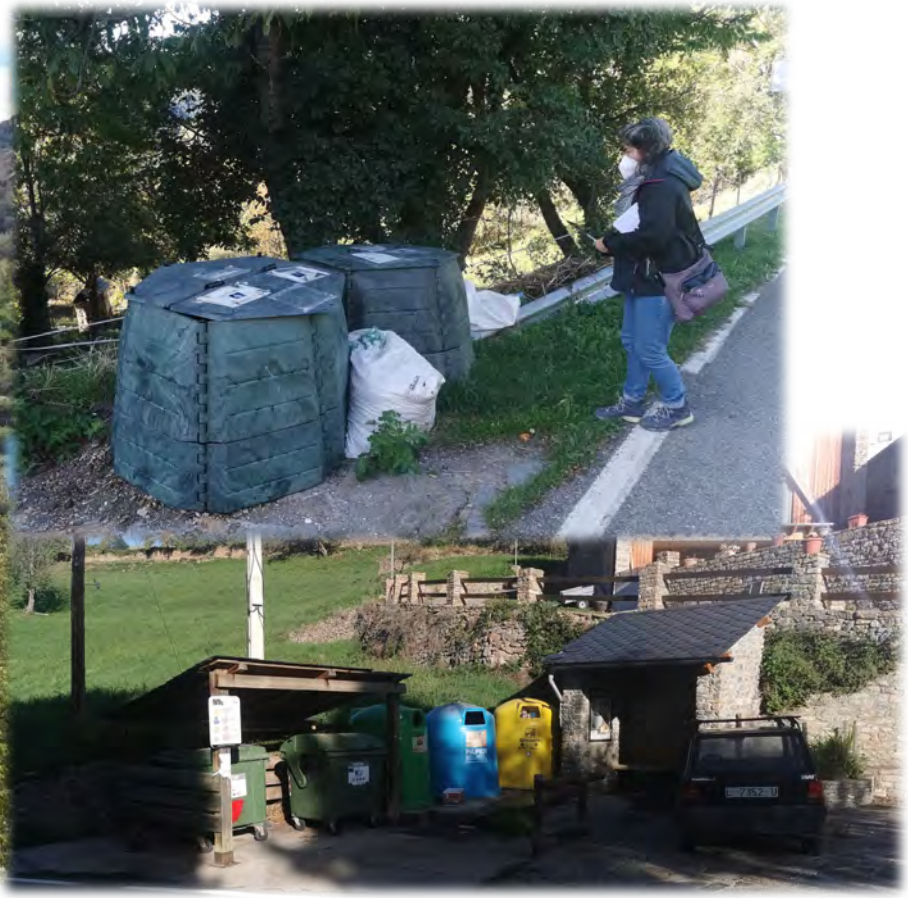
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Pallars Sobirà (Lleida)



Malmercat, Pallars Sobirà (Catalonia, Spain)
Source: Ajuntament de Soriguera





Key vulnerability

Population centres generating less than 50 tonnes per year

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LOCAL COMPOSTING IN DIFFERENT CONTEXTS (REST OF THE WORLD)

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The Flemish model: a regional network supporting local composting



Implementation and coverage

Launched in 1995; expanded to almost all Flemish municipalities.

Over 40% of the population practices home composting.

Organisation and human resources

Regional coordination and training by Vlaco.

≈5,000 Master Composters trained over 25 years; ≈2,000 active volunte

≈40 trainers supporting volunteer training and continuous development.

Municipal environmental officers supporting local volunteer teams.

Operational approach

Restricted range of accepted materials, primarily plant-based kitchen waste and garden waste, with meat, fish and other animal-derived food residues generally excluded.

Practical guidance, demonstrations and direct support to households.

Integration with separate biowaste collection, providing complementary management routes for different organic waste streams.







Key vulnerability







Source: Van Stichelen, K., 2023 and own data

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Bolivia - To Pachamama through composting







INTEGRATED WASTE MANAGEMENT LAW – 28 October 2015

SECCIÓN II

APROVECHAMIENTO DE RESIDUOS

Artículo 14. (APROVECHAMIENTO DE RESIDUOS).

I. El aprovechamiento de residuos es el conjunto de acciones que permiten la reutilización de los mismos o la reincorporación al ciclo productivo de los diferentes recursos presentes en los mismos, para generar beneficios al medio ambiente y a la economía del país, mediante el compostaje, reciclaje o aprovechamiento energético.

II. Se dará prioridad al reciclaje y compostaje sobre el aprovechamiento energético.

III. Para garantizar el adecuado aprovechamiento de los residuos, se debe implementar sistemas de separación en origen y recolección diferenciada, así como la instalación de infraestructura y equipos de acuerdo a reglamentación de presente Ley. Forman parte de este proceso, las instalaciones de acopio o clasificación de residuos.

IV. El nivel central del Estado y las entidades territoriales autónomas, en coordinación con el sector productivo, implementarán los mecanismos y estrategias para promover el máximo aprovechamiento de los residuos, antes que su disposición final.





https://redcompostaje.mmaya.gob.bo



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Bolivia - Tiquipaya



Tiquipaya Biowaste Composting Plant (Cochabamba)







Treatment capacity 800 t year^{-1}







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Bolivia (La Paz) - Community composting



Community Composting in Auquisamaña and Laka-Uta (Següencoma), Bolivia







Key vulnerability







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USA - Local composting in New York City











In New York City, local composting has been part of the municipal strategy to reduce the amount of biowaste requiring collection and centralised treatment.

Despite major funding cuts in 2024, the community composting network remains active thanks to City Council support, although its long-term funding is still uncertain.



Community Composting In New York City

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Mongolia - Household and community composting (Ulaanbaatar)



Adaptation of the treatment model to local conditions:

- ✓ Shortage of bulking agents
- ✓ Extreme winter temperatures
- ✓ Low generation of food waste









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Mongolia - Compostatge doméstic i comunitari (Ulaanbaatar)



- ✓ Kindergartens, primary and secondary schools.
- ✓ Participation of students and teachers.
- ✓ Expansion to large waste generators.

Key vulnerability















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China – Sowing the seeds in the Far East







Study visit on decentralised composting examples in Spain organised by the Vanke Foundation (October 2019)







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China – Sowing the seeds in the Far East



Faro de Vigo » Pontevedra » Noticias de Pontevedra

Noticias de Pontevedra

China se propone como objetivo adaptar el Plan Revitaliza a su país

La delegación china que visitó Pontevedra alabó esta gestión de los biorresiduos

Carolina Sertal | Pontevedra | 02.10.2019 | 02:15



Carmela Silva y César Mosquera, ayer, con la delegación china. // Gustavo Santos

El modelo de gestión de biorresiduos de la Diputación de **Pontevedra**, denominado Plan Revitaliza, continúa atrayendo todas las miradas a nivel internacional. Durante la jornada de ayer, la secretaria general de la fundación china Vanke Foundation manifestó que "en nuestro país, cada vez el Gobierno está tomando más medidas para gestionar los biorresiduos y en nuestra fundación estamos comprometidos para lidiar con esta problemática. Es por esto que, cuando volvamos a China, tenemos que ad[illegible]istema que hemos visto en Pontevedra a nuestro país, ya que estos días [illegible]do que existen otras alternativas".

FARO DE VIGO
DOMINGO, 6 DE OCTUBRE DE 2019

Xuehua Zhang » Directora científica da Universidade de Nainjin

"Revitaliza é representativo do modelo a seguir, un dos mellores ensinos"

"E moi interesante focalizar no individual e conseguir que a xente se involucre de maneira directa"



Xuehua Zhang, directora científica do Instituto de Investigación Ecolóxica Lishui da Universidade de Nainjin en China.

REDACCIÓN [PONTEVEDRA]

Xuehua Zhang é a directora científica do Instituto de Investi-
[illegible]
a Pontevedra para coñecer in situ o Plan Revitaliza de compostaxe da Deputación xunto ao resto da delegación chinesa formada por membros do goberno, outros científicos, consultoras, ong e freelance.

- Que foi o que lles trouxo a coñecer o Plan Revitaliza de compostaxe?

- O persoal técnico co que conta a Vanke Foundation é do máximo nivel e púxonos en contacto con expertos europeos de grande valía como Ramón Plana, que é o responsable dos contactos e da viaxe da delegación. Queriamos ver exemplos das mellores prácticas de compostaxe descentralizada e o Revitaliza foi o modelo que nos propuxeron.

- E que opinión lle merece?

Para min, o que estou a ver do Revitaliza é representativo do modelo a seguir, é unha grande achega, e coñecelo directamente é un dos mellores ensinos. O que estamos a facer en China é un enfoque de abaixo cara arriba. Aquí o que estou a aprender é como os expertos que traballan co goberno teñen un enfoque de empuxe dende arriba cara abaixo, cara a xente, e traballan coa comunidade e as persoas que desexan participar. Atopo este proxecto fascinante, porque penso que é o único exemplo que coñezo no que o programa está impulsado dende arriba abaixo polo goberno e por expertos. Nós non avanzamos niso aínda.

- Que outros países están a servir de inspiración para buscar o modelo definitivo?

- Se o modelo Pontevedra se compara con outros proxectos en Europa, vemos que a compostaxe que se plantexa en Alemania, onde estiven este ano por exemplo, é a maior escala, con modelos centralizados e outros que eles chaman descentralizados. Este, o Revitaliza, é un plan de compostaxe comunitaria. Alá vimos grandes compostadores, pero aquí vós realmente tedes compostaxe descentralizada, comunitaria e inclusive domiciliaria, individual, e penso que é moi interesante focalizar no pequeno e conseguir que a xente se involucre de maneira directa e íntima no proceso, aprendendo o que pode facer cos seus desperdicios. Penso que é un modelo único nese sentido en Europa.

- Que é o máis destacable deste plantexamento?

- O que aprendín é a firmeza dos líderes políticos como César Mosquera que acudiu a experto[illegible] e decidiu facer isto. A maneira de incineración e do enfoque centralizado, pretende facer algo [illegible] desperdicio de alimentos. Nun[illegible] atopara en outras cidades un enfoque superior.

"Al volver a China adaptaremos lo aprendido aquí del Plan Revitaliza a nuestro contexto"

Pontevedra 01 de octubre 2019

Oskar Viéitez | Cristina Saiz

Carmela Silva y César Mosquera recibieron a una delegación china interesada en el Plan Revitaliza. Se trata de un viaje organizado por la Fundación Vanke, que patrocinó un itinerario por Italia, Pontevedra, País Vasco y Navarra para conocer los modelos de gestión de basura orgánica más avanzados en Europa



[illegible]pción a la delegación china interesada en el Plan Revitaliza / Cristina Saiz

[illegible]ENERAL

[illegible]parte el artículo en:

[illegible]egram

[illegible]ail

Publicidad

El Pazo Provincial de la Deputación de Pontevedra acogió este martes la recepción institucional de la presidenta Carmela Silva y el vicepresidente César Mosquera a **una delegación china interesada en el Plan Revitaliza.**

Se trata de un viaje organizado por la Fundación Vanke, que patrocinó un itinerario por Italia, Pontevedra, País Vasco y Navarra para **conocer los modelos de gestión de basura orgánica más avanzados en Europa.**

Sus integrantes son miembros del gobierno provincial del Cantón, de ONG, científicos y expertos en los residuos y visitaron a lo largo del día varios centros de compostaje comunitaria que, según consideran, son **perfectamente exportables a algunas zonas de su país.**

"When we return to China, we will adapt what we have learned here to our own context."

PhD. Ramón Plana – Organic Wastes Management Consultancy

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China - Community composting





Since 2019, the *Vanke Foundation* has led pilot programmes in 50 communities across 22 cities in 14 provinces.

Safe composting practices, accepted by local residents; activities remain ongoing at nearly half of the sites.

Some cities (such as Qingdao) offer incentives for local composting.





Key vulnerability

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Israel - *Kibbutz* Baraam (Upper Galilee)













Key vulnerability





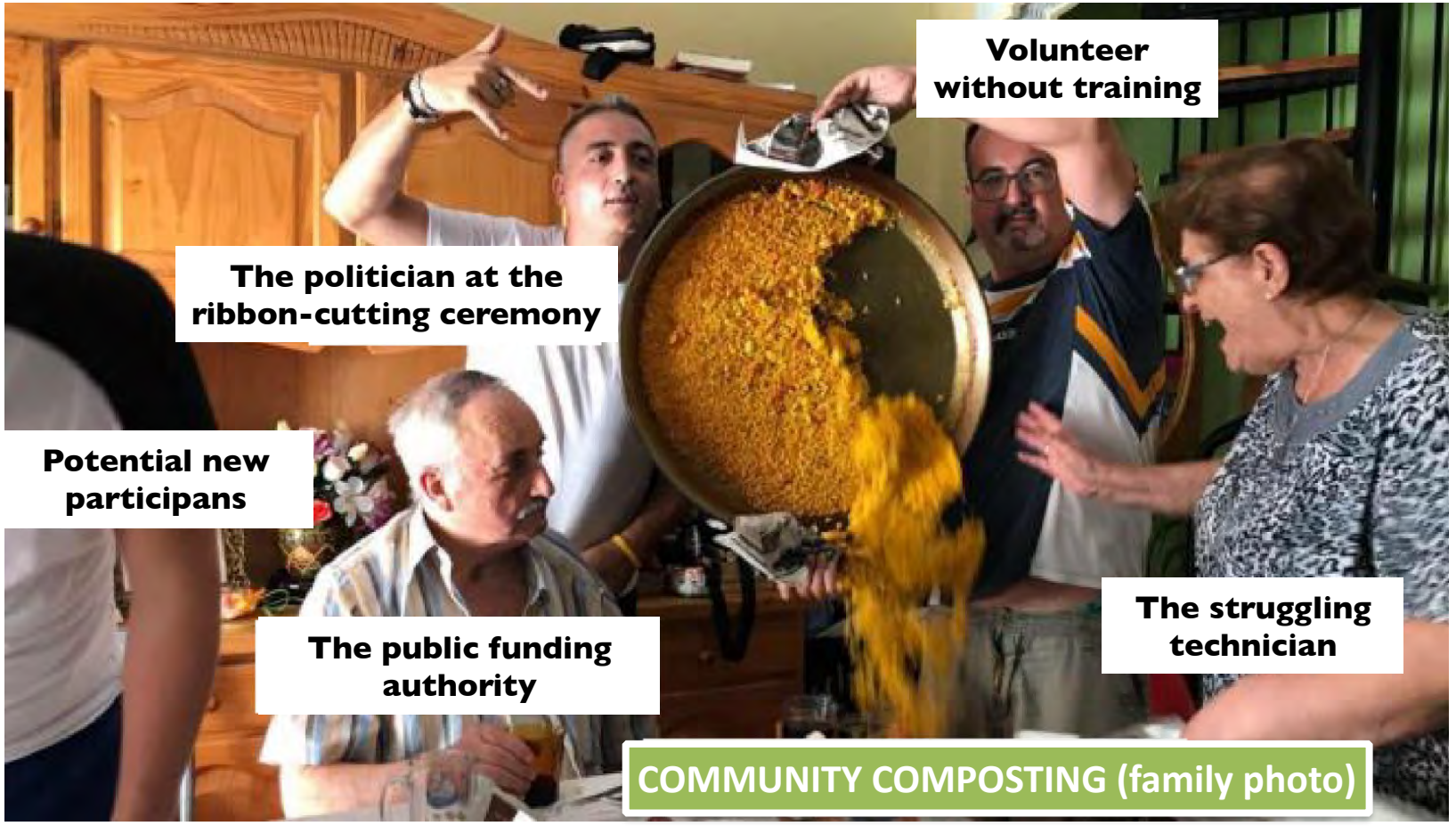


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It looks easy, but don't be fooled…





***Source**: Campustaje, Carlos Jimenez 2019*

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Thank you very much!!!

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"As we have amplified our ability to shape the world, so we become more responsible for the long afterlives of that shaping. The Anthropocene asks of us the question memorably posed by the immunologist Jonas Salk: ***'Are we being good ancestors?'***"

Robert Macfarlane, Underland: A Deep Time Journey