

RGS-IBG Annual International conference

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Session:

*Critical reflections on the changing landscapes
of food waste*



Is the food waste hierarchy misleading to
sustainable use of food ?

Learnings from a literature review



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introduction

Waste management guidelines applied to food



限りある地球の資源を大切に!

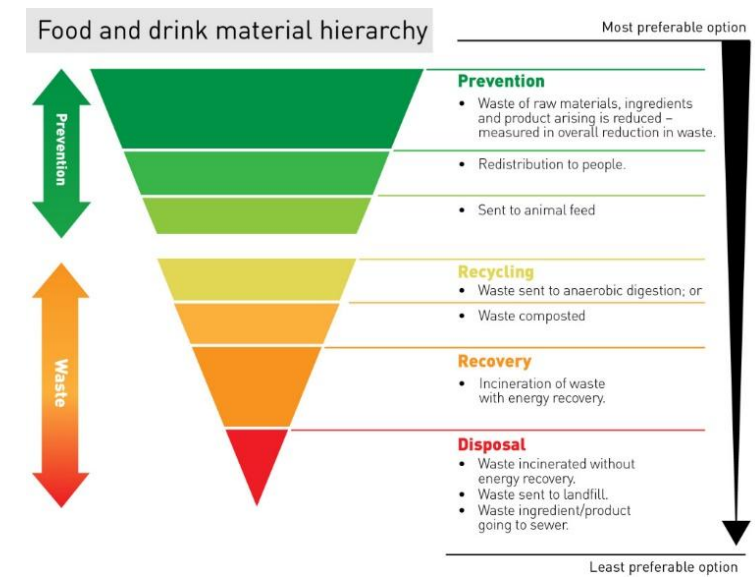
General guidelines for waste management (3R concept – Reduce, Reuse, Recycle; 5 level waste hierarchy from the EU Waste Framework Directive 2008, 2018) applied to food



Source: US Environmental Protection Agency



Dutch Ministry of economic affairs, Moermann ladder



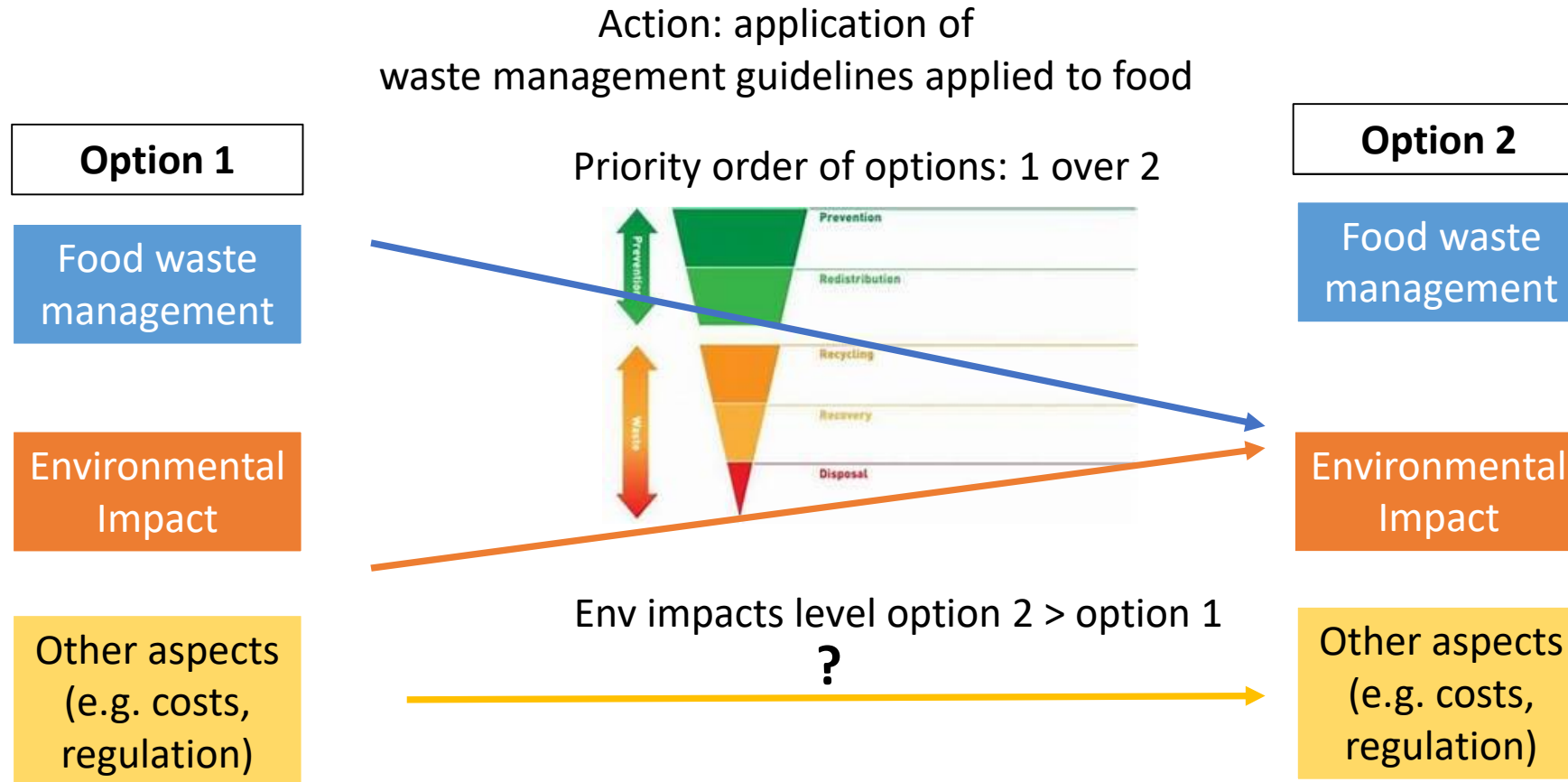
Source: WRAP

BUT:
Application not straightforward

Core question of the literature review:

« What are limits to waste management guidelines applied to food? »

Analysis framework for the literature review



What are limits to waste management guidelines :

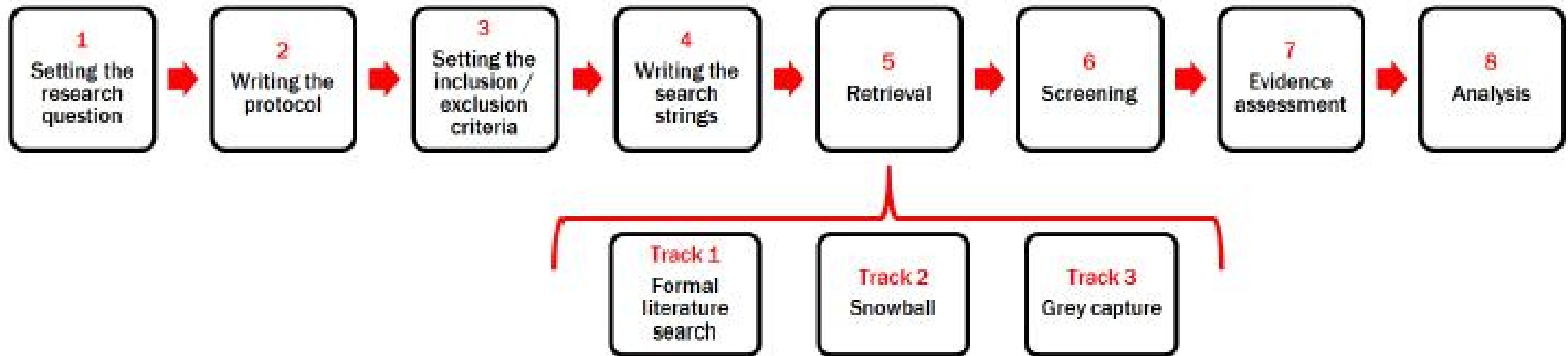
- the effectiveness with respect to « best environmental outcome »? Other aspects?
- to the normative frame of the concept of the hierarchy itself?

Methodology of the literature review

Method for a systematic literature review

*cf guidelines in Food Policy journal: Hagen-Zanker, Mallet 2013;
Denyer and Tandfield, 2009*

Figure 1: Stages in a rigorous, evidence focused literature review



Source: Hagen-Zanker and Mallet 2013, authors' adaptation of existing approaches

Inclusion/exclusion criteria

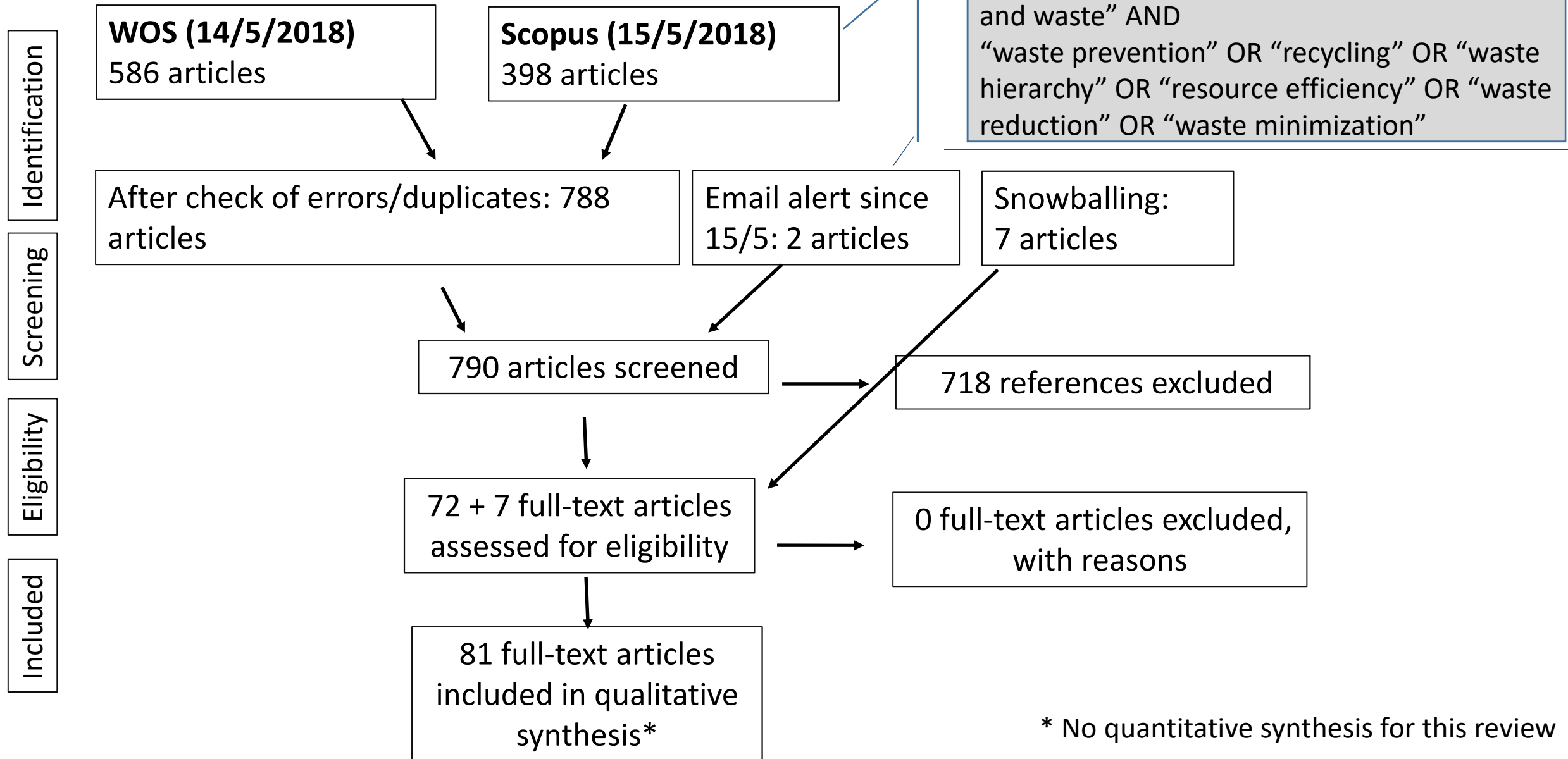
For inclusion in the review, articles look at

- **Performance** (results according to different dimensions such as environmental, social, economic etc) of different **food waste management options in comparison**, in order to confirm or infirm ranking of the hierarchies
- Policy and policy-relevant aspects of **food waste reduction**: policy analysis papers, conclusions from articles relevant for policy (acceptance of policy instruments , effectiveness of policy instruments or types of intervention) related to management options in comparison
- **OECD countries only** (because of their organized waste management system, etc.) **plus China and Singapore** (many publications in this field, Westernized big cities with organized waste management systems, etc.)
- Articles published in English in peer-reviewed journals (incl comments, letters to the editors)

For exclusion from the review, articles *exclusively* look at

- Improvement of a food waste handling option through technical, organizational etc means
- Food waste quantification
- Current situation of food waste management or of its evolution across time
- Reasons, drivers, determinants for food waste generation, behavioral issues
- Packaging associated to food waste and other food related material such as compostable tableware
- Food waste reduction as a means to solve other problems (energy shortage, climate change, etc.)
- Industry or farming by-products

Reporting of information flow on the systematic review (cf PRISMA)



Predominant environmental science and sustainability journals

Journal titles	Nb of ref
Journal of Cleaner Production	14
Waste Management	11
RESOURCES CONSERVATION AND RECYCLING	9
Food Policy	4
Science of the Total Environment	4
Environmental science and technology	3
Journal of Environmental Management	3
Journal of Material Cycles and Waste Management	3
Sustainability	2
American Journal of Agricultural economics	2
Bioresource technology	2
International Journal of Life Cycle Assessment	2
Waste Management and Research	2
20 Journals with 1 article each	20
TOTAL	81

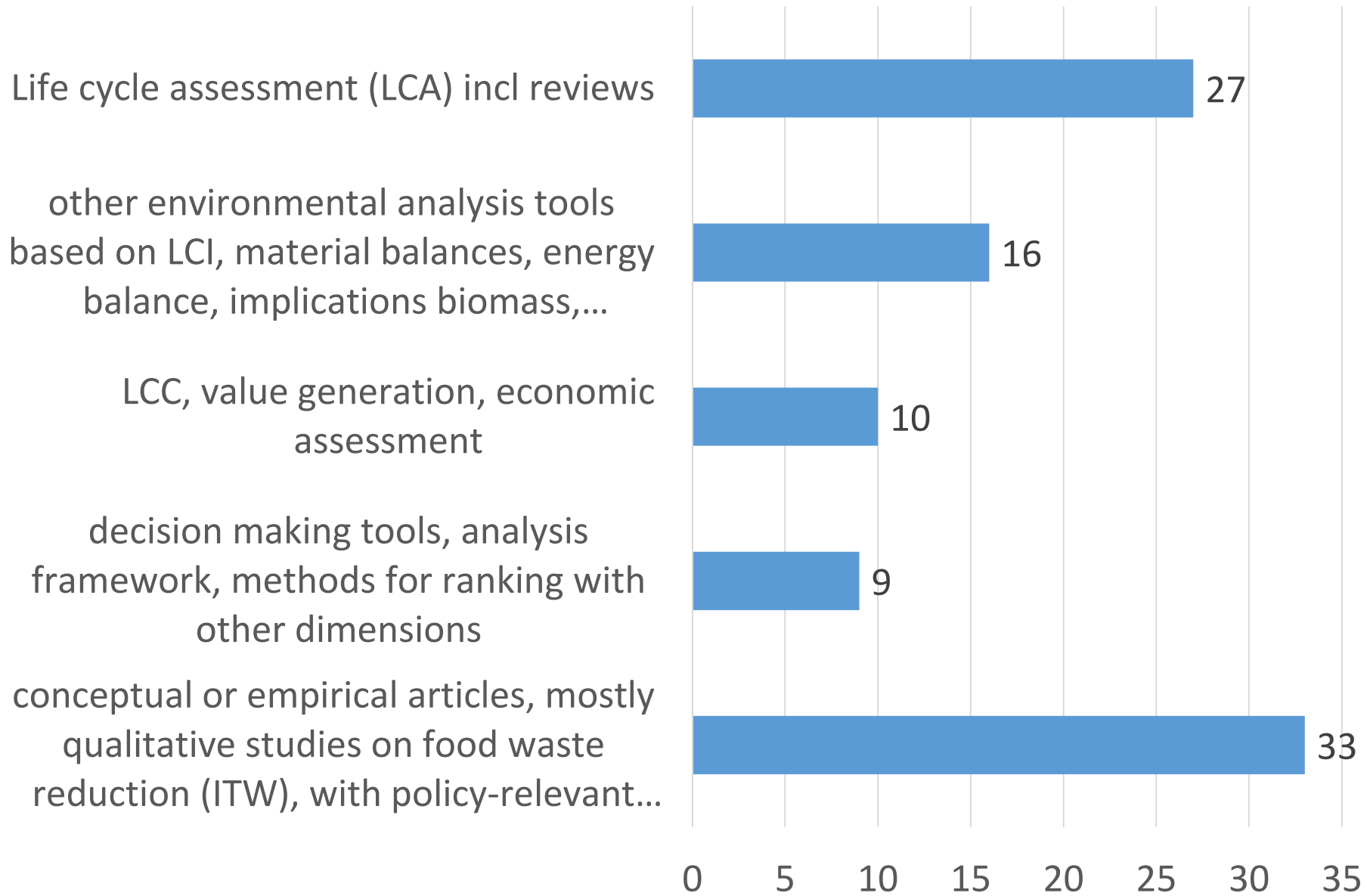
Few « non-environmental science » journals e.g., Critical public health, Journal of Hunger & Environmental Nutrition, Cities, Geoforum, Annals of Operations Research

Strong development of publications in the past 4-5 years

Publication year	Nb of ref
2018	13
2017	20
2016	19
2015	9
2014	7
2013	1
2012	3
2011	4
2010	3
2009	1
2007	1
TOTAL	81

68 that is > 80% of those 81 articles published in the past 5 years

Number of reviewed papers according to method



Multiple responses possible per paper (combination of methods)

Results of the literature review

Limits (1) – effectiveness of the waste hierarchy applied to food

Food waste considered as the organic fraction of municipal solid waste (21 studies, 2007 +)

- Decision support for **local waste managers** (focus on low environmental impact levels (often climate impact))
- Food waste = **bulk organic waste**, organic fraction of municipal solid waste
- By nature of the scope, **options lower down the hierarchy** considered (composting, anaerobic digestion, incineration, landfill, in some studies, animal feed) (exception: Bernstad, Canovas 2015 incl prevention)
- Pioneering literature industrialized Asia (Korea, Japan, Singapore, Taiwan), case studies
- Literature review (Bernstad et al 2016) on LCA methodology in food waste management (**climate impact**) (19 LCA studies, 2003-2012)

Surplus and waste from food searching for options higher up the hierarchy (6 studies, 2015 +)

- **Food supply chain operators** as decision-makers (**retail**)
- **specificities of food** (nutritional composition, water- and energy content, fit for consumption etc.); **case of fruits and vegetables !**
- options for **surplus food before becoming waste** : donation, animal feed
- Studies from Europe (Eriksson et al. 2015, 2017, Moulton et al., 2018; Brancoli et al. 2018)
- Focus on GHG emissions/**climate impact**

Limits (2) – obstacles to compliance with the waste hierarchy

- Local context dependance of the performance of the waste hierarchy: infrastructure availability or acceptance (NIMBY) (Benyam et al.), incentive / cost structure (LCC, cost-benefit analysis, Swaffield et al., 2018),
 - Regulation: ban of food waste use for animal feed in the EU (*zu Ermgassen et al. 2016*), food safety regulation (Guillier et al., 2016)
 - undifferentiated approach to food surplus (perishability, fit for consumption etc.) does not allow for prevention / redistribution options
 - Reputation, civic justifications (Swaffield et al., 2018)
- ➔ Development of multi-criteria decision-support tools (beyond LCA+LCC)

Limits (3) – the « raison-d'être » of the waste hierarchy applied to food

Mourad (2016)

- Interpretation of the waste hierarchy by actors according to what best suits their environmental, economic or social interests (competing not win-win-win solutions),
- legitimization by the hierarchy whatever management options chosen

Benson et al. (2017) conflicting goals within the hierarchy

According to Bradshaw (2018)

- No solution to food waste, but reinforcement of « the structural failure of the food system to value food » (narrative of « waste as a resource not a problem » / WFD 2008, « circular economy »)
- Food's importance and difference as a resource
- Questioning what role could food law take over in food waste reduction policy?

Discussion

Discussion

- Question of scientific quality and evidence assessment of the literature body
- Important articles missing (social sciences, law etc.)?

→ *Is the food waste hierarchy misleading to sustainable use of food ?*

Yes, the underlying management posture does not question the current rationale of food waste generation and its enabling environment in industrialized societies.

A shift in the literature towards a more food than waste focussed perspective on food waste?

Conclusions and recommendations

Scientific gaps :

- Incentive structures to strengthen prevention strategies (targeting structural not only individual changes)? New business models to change structural determinants of food surplus and waste? Role of private actors?
- implications of different management options for food surplus and waste for wider environmental issues (e.g. socio-ecological analysis of nutrient flows), other dimensions (economic and social), in connected food – waste systems

Implications for the waste hierarchy applied to food ?

- *Does the confirmed ranking hold considering the lack of diversity in environmental science methods in the literature? Conflicts and synergies with economic and social dimensions?*
- *Implications for policy – a new strategie for food waste prevention in policy (perspectives opened by Bradshaw, 2018 for food law not waste law)? Separate from recycling ?*



Thank you for your attention!

