

# The Role of Temporary Material Hubs and Final Sinks in Circular Economy

R. Kopecká, M. Hrad, M. Huber-Humer

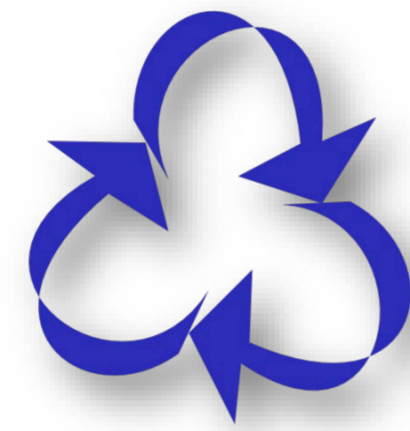
## Background

The European Directives set goals to **increase circularity**, such as the goal to increase the **reuse, recycling, and recovery** and to **quit** landfilling materials suitable for recycling or recovery by **2030**.<sup>1</sup> However, the EU's circularity rate was only **11.5%** in **2022**.<sup>2</sup> Additionally, contaminated materials entering recycling streams (e.g., paper contaminated by polychlorinated biphenyls) jeopardize their quality. The EU lacks a formal definition of recyclability, and recycling of some materials remains to be challenging. Currently nonrecyclable materials are subject to thermal treatment or controlled disposal.



## What are the current recycling challenges?

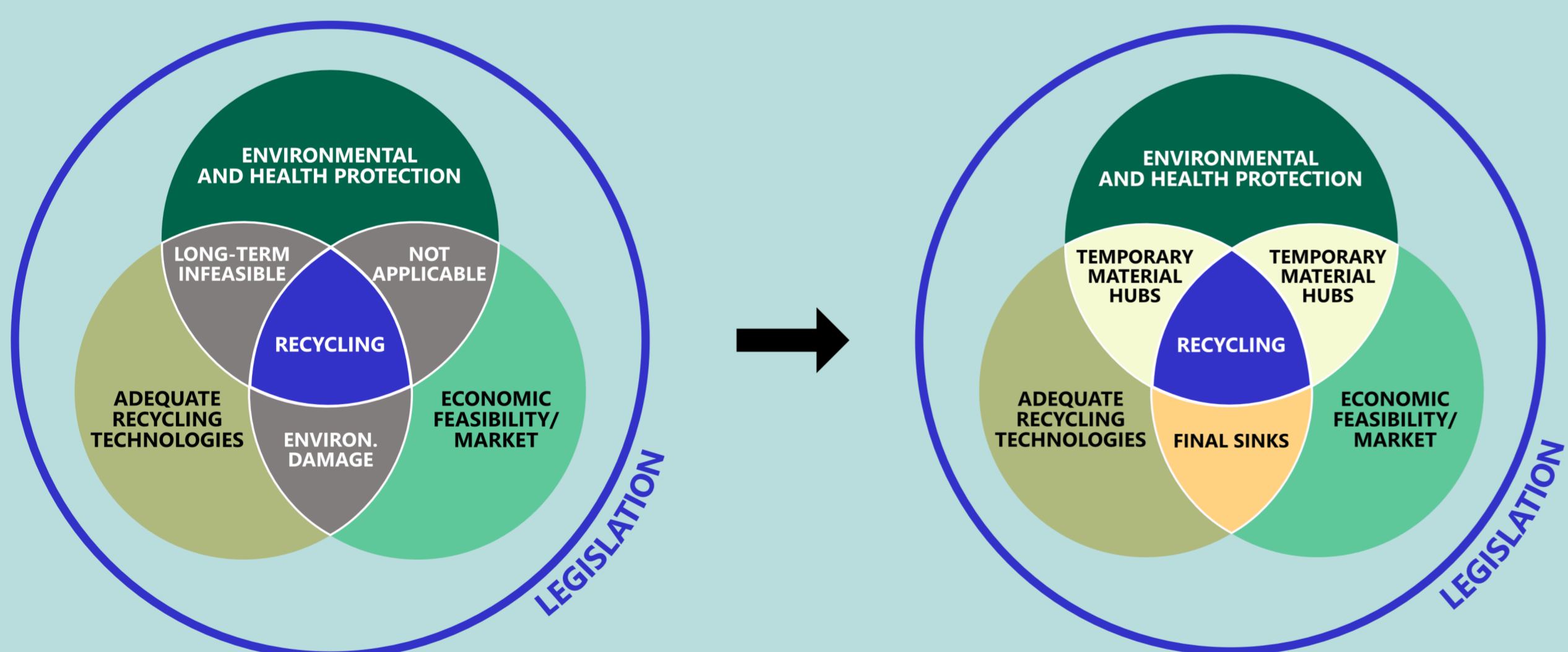
- competition with **energy recovery**,
- **compromised quality** of recycling outputs,
- difficult assessment of potential **environmental benefits** of recycling in monetary terms,
- **lack of end-of-life considerations** from product designers,
- increasing number of substances identified as **harmful**,
- **limited** waste composition data,
- **low prices** of raw materials (e.g., fossil oil),
- etc.



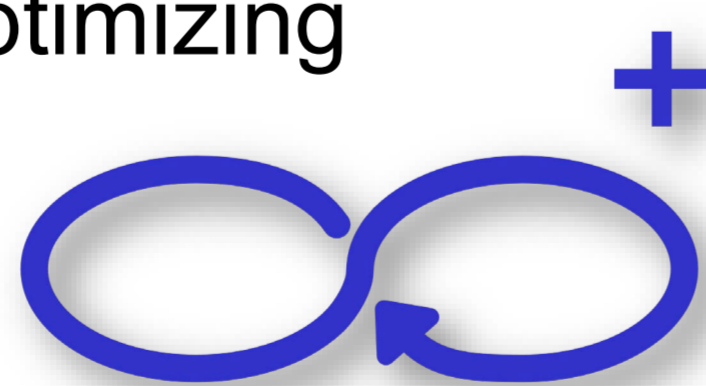
## Proposed innovative concept

- **proposing a definition of recyclability based on 3 key pillars**
- **optimizing circularity based on:**
  - 1) **postponed recycling** of materials feasibly recyclable in future
  - 2) **maintaining the cleanliness** of material flows by keeping contaminated or degraded materials out of anthropogenic cycles

### Filling in the gaps within proposed recycling pillars



The combination of **temporary material hubs** and **final sinks** enhances and fills in the gaps in circularity by optimizing the duration of materials within anthropogenic cycles, while keeping the cycles clean.



### Temporary material hubs

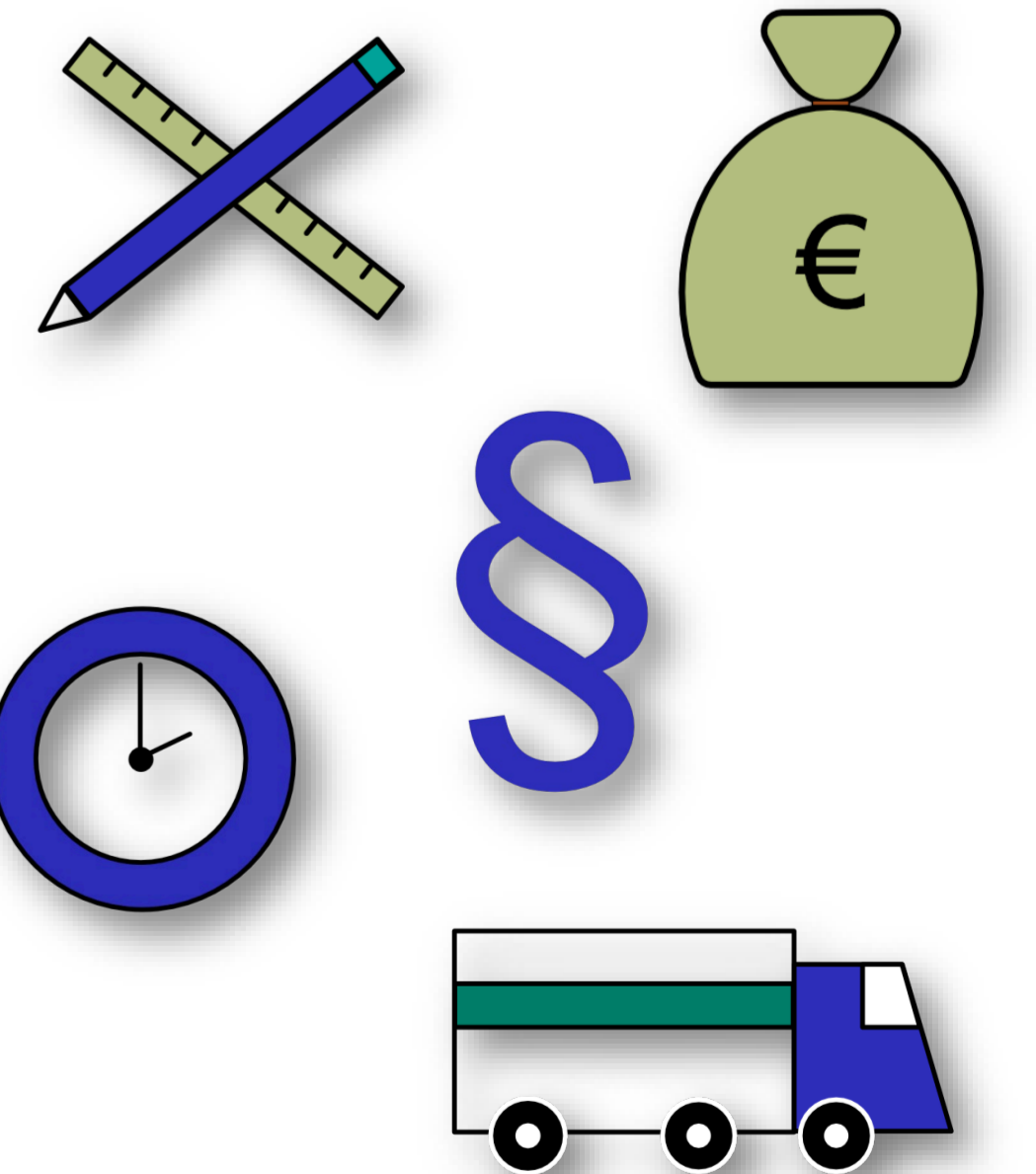
- storage of waste for **postponed feasible recycling** in future
- intended storage time **longer** than the one allowed by current legislation
- **targeted re-mining** with better economic efficiency than current landfill mining

### Final sinks

- sinks destroying a substance completely or holding it for a long time period<sup>3</sup>
- safe final disposal for **non-recyclable** or **contaminated** waste
- currently **well-performing waste-to-energy plants** and **underground-landfills**

## Outlook and discussion

- How will be such concepts **designed**?
- What are the **technical requirements**?
- What will be the **time-frame**?
- What about **economic viability**?
- What are the **regulatory challenges**?
- Where to **locate** such material hubs?
- ...



## References

- 1 European Parliament and the Council, 2024b. Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.
- 2 European Environment Agency, 2024. Now is the time to accelerate the shift to a more circular Europe [WWW Document]. URL <https://www.eea.europa.eu/en/newsroom/news/now-is-the-time-to> (accessed 10.3.24).
- 3 Kral, U., Kellner, K., Brunner, P.H., 2013. Sustainable resource use requires “clean cycles” and safe “final sinks.” Sci. Total Environ. 461–462, 819–822. <https://doi.org/10.1016/j.scitotenv.2012.08.094>

## Contact of poster:

Romana Kopecká, MSc.  
Institute of Waste Management and Circularity  
BOKU University; Muthgasse 107, 1190 Vienna

Phonenumber: +43 1 47654-81312  
E-Mail: [romana.kopecka@boku.ac.at](mailto:romana.kopecka@boku.ac.at)  
Website: [boku.ac.at/wau/abf](http://boku.ac.at/wau/abf)

