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# ***Transition to sustainable urban waste management***

Nordic Research and Innovation Pathways towards a Circular Bio-economy  
NoRest Conference, Copenhagen 25.-26. October 2016

# Background

- Climate change and need for environmental sustainability
- Megatrend of urbanization > Need for creating infrastructures and sustainable systems for management and processing of urban waste
- Such systems are heavily integrated across many sectors such as energy, transport, agriculture, infrastructure, consumption and renovation
- Path dependence of socio-technical regimes > can be hard to change

# Research questions

- What do systems of sustainable urban waste management look like?
  - Integrated across several sectors
  - Ambitions (Waste pyramid)
- How can urban waste management systems be redesigned?
- How do governance models and incentive structures affect innovation dynamics in urban waste management?

# Objectives

- Comparative case study of two systems of urban waste management in two city regions in south-east Norway
- Contribute to our understanding of how transition to sustainable urban waste management takes place
- Improve our understanding of how these processes of urban socio-technical change can be governed

# Conceptual framing of the paper

- Socio-technical regimes & MLP (Geels, 2002)
- System transformations a ) open ended, b) constantly redefined and renegotiated c) across many stakeholders (Kuhlmann & Rip 2014)
- Governance of socio-technical transitions - transformational system failures (Weber & Rohracher 2012)
  - Directionality failure
  - Demand articulation failure
  - Policy coordination failure
  - Reflexivity failure
- Governing infrasystem transitions (Frantzeskaki and Loorbach 2010)
  - Long term planning
  - Flexible designs

# Gaps in the literature

- A need for more analytical and empirical efforts in the study of governance of change (Borras & Edler 2014)
- Need for more comparative studies of socio-technical transitions (Markard, Raven & Truffer 2012)
- Need to improve our understanding of cross-sectoral dynamics in socio-technical transitions (Bergek et al. 2015)

# Research design and methods

- Document analysis
- Participation at industry and policy seminars and conferences (5)
- Site visits (2)
- Semi-structured interviews (6)
  - Face to face, 1 – 1,5 hours
  - Interviews transcribed
  - Summing up main impressions subsequent to each interview
- Preliminary findings
- Work in progress – more interviews will be conducted...

# Location of the two case studies

- Oslo: Capital of Norway
- Drammen region: Smaller neighbouring municipality





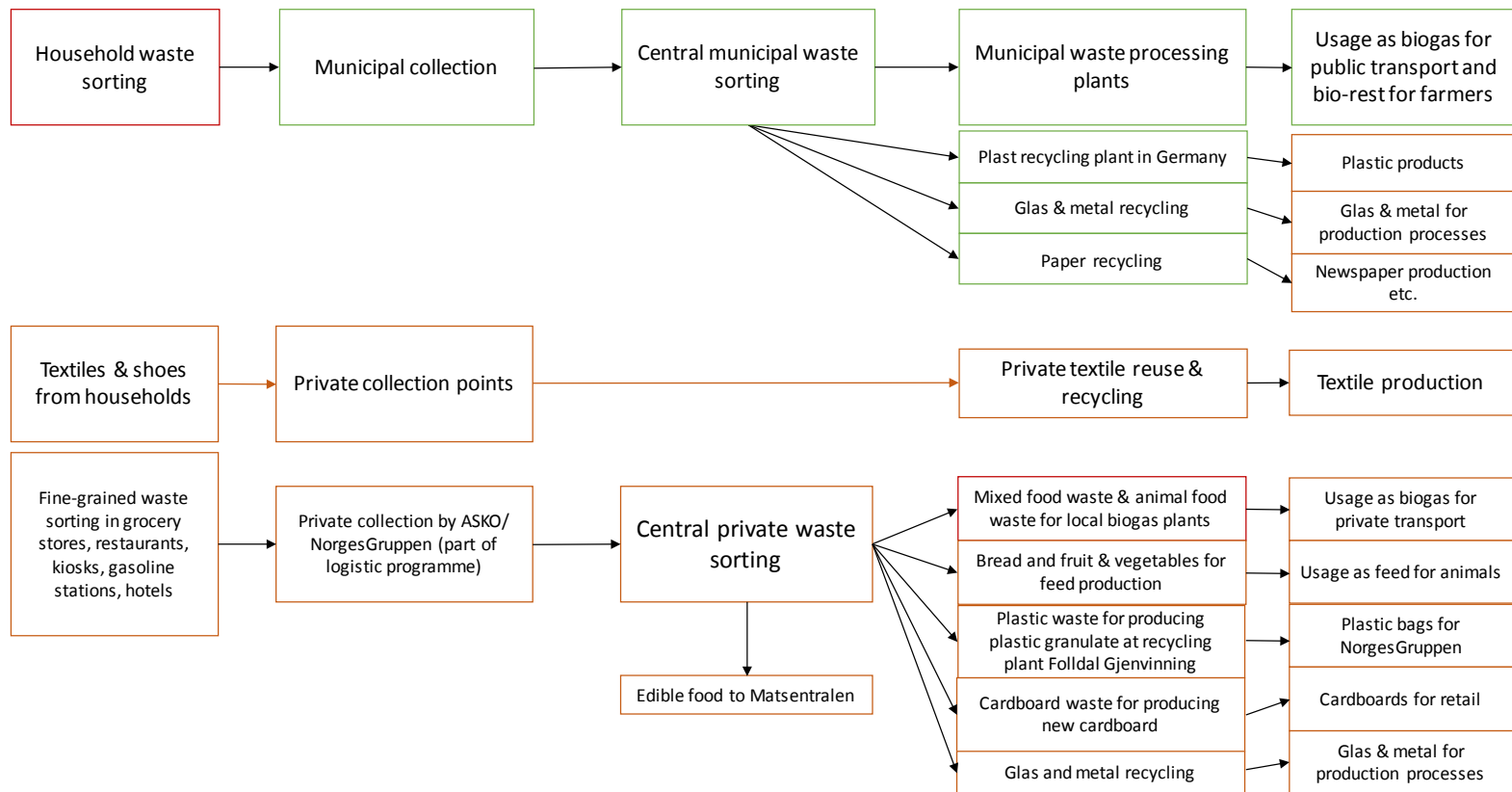
## Comparative case study: Urban sustainable waste management in Oslo and Drammen

	Oslo	Drammen
Number of inhabitants	658.393	67.896
Area in km <sup>2</sup>	454	137
Household waste per inhabitant in kg	336	531
Delivered to material recycling and biological treatment per inhabitant in kg	130	244
Share of waste delivered to material recycling, including biological treatment in %	39	46
Share of waste delivered to incineration in %	58	51

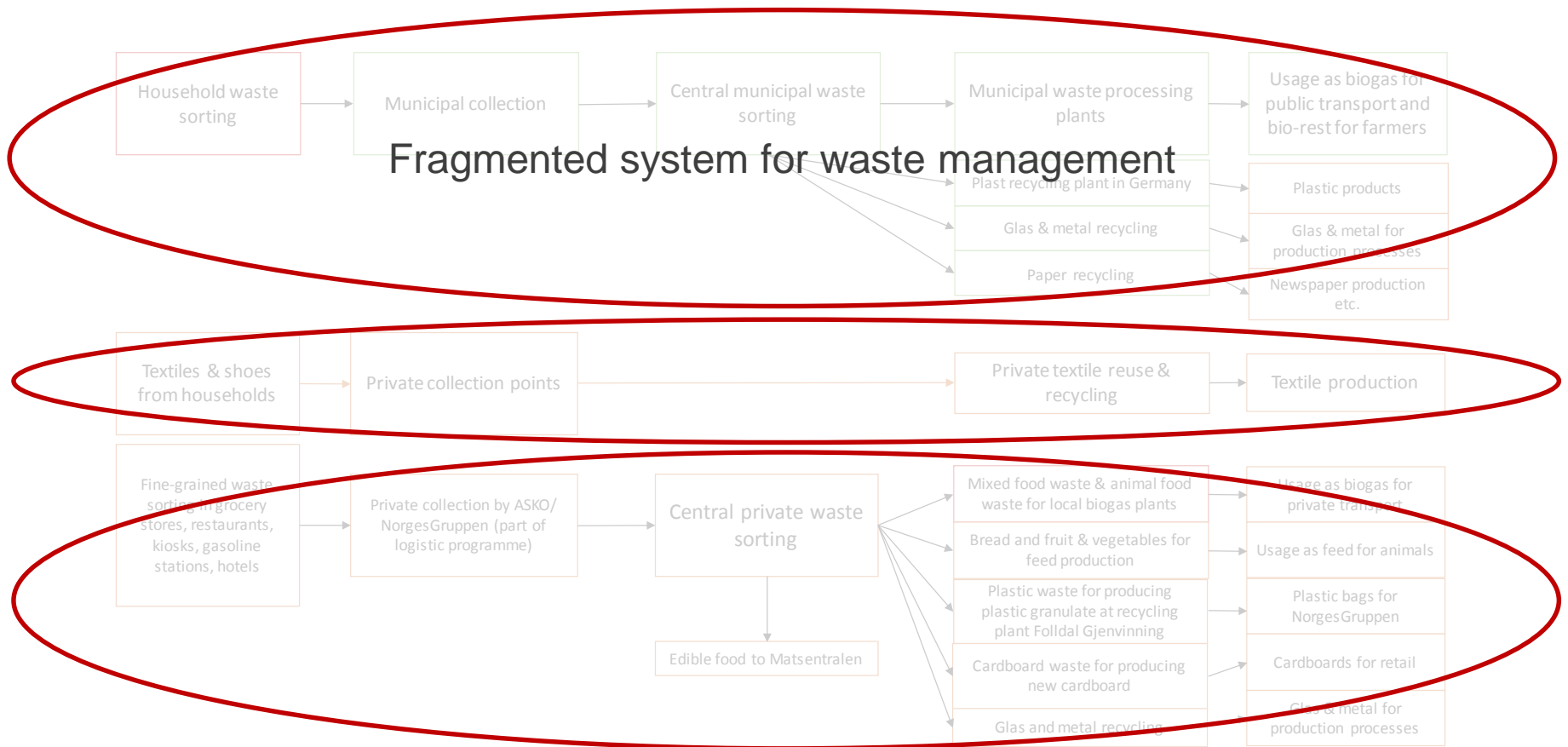
# The Oslo case

- Political initiative 2005 / 2006: New mandate: Supplement incineration for district heating with recycling of waste
- Transition agent and central driving force: Energy agency and Renovation agency in the Municipality of Oslo
- Ownership model (agency) inhibits processing of organic industry waste
- International waste inputs > local outputs
  - Imports waste from other countries
  - Processes organic waste resources from Oslo households and from neighbouring inter-municipal waste processing company ROAF (Romerike)
- The inhabitants primarily producer of waste
- Parallel public and private sector systems of waste management
- Coordination challenges across public and private sector
  - Unexploited capacity at biogas plant
  - Unexploited potentials from private businesses, manure and sewage sludge
- Municipality of Oslo has no incentives for searching for new materials and value added products and for 'closing the loop' e.g. eco-designs etc.

# The Oslo case: Parallel private & public systems



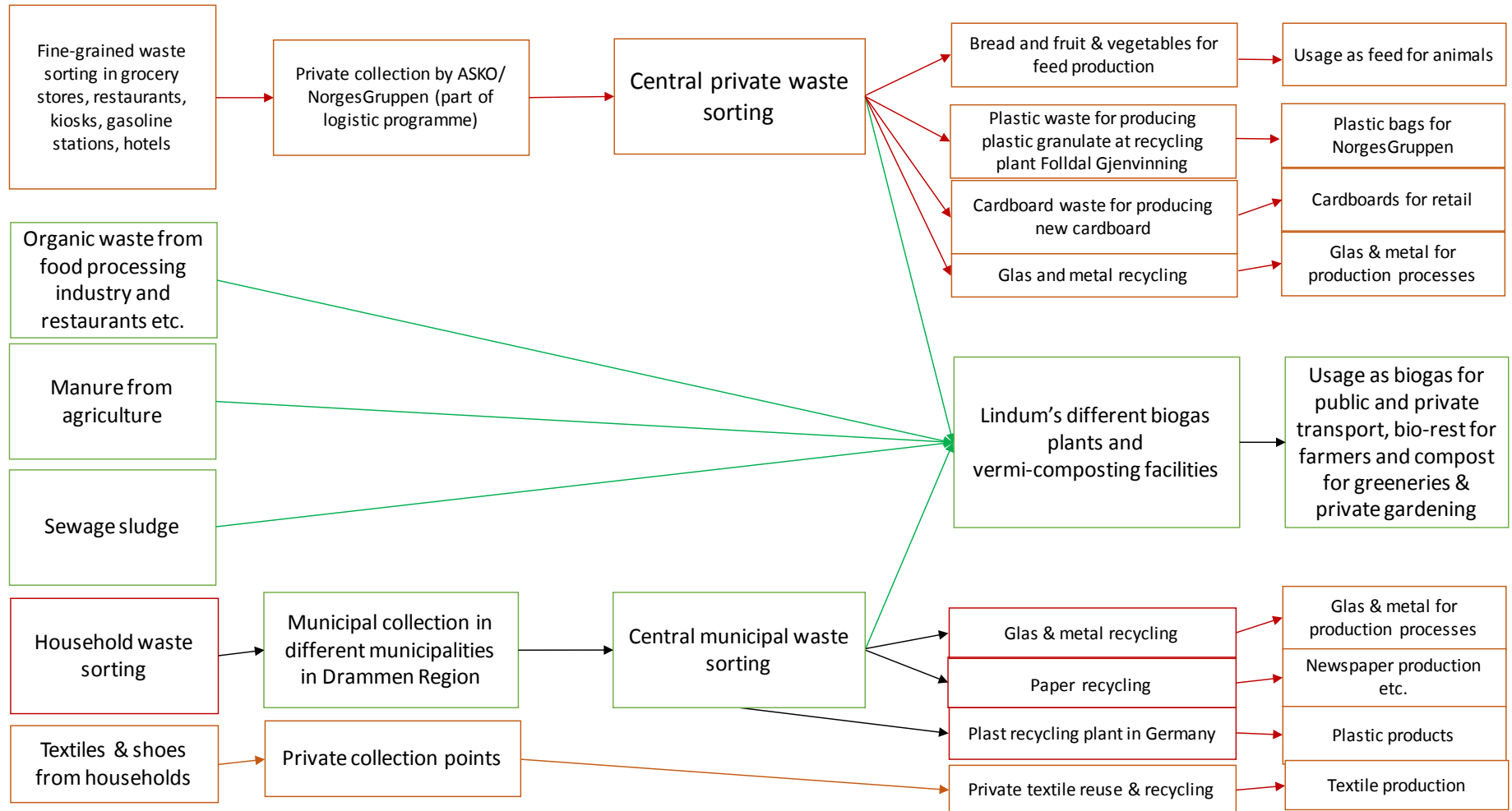
# The Oslo case: Parallel public, civic & private systems



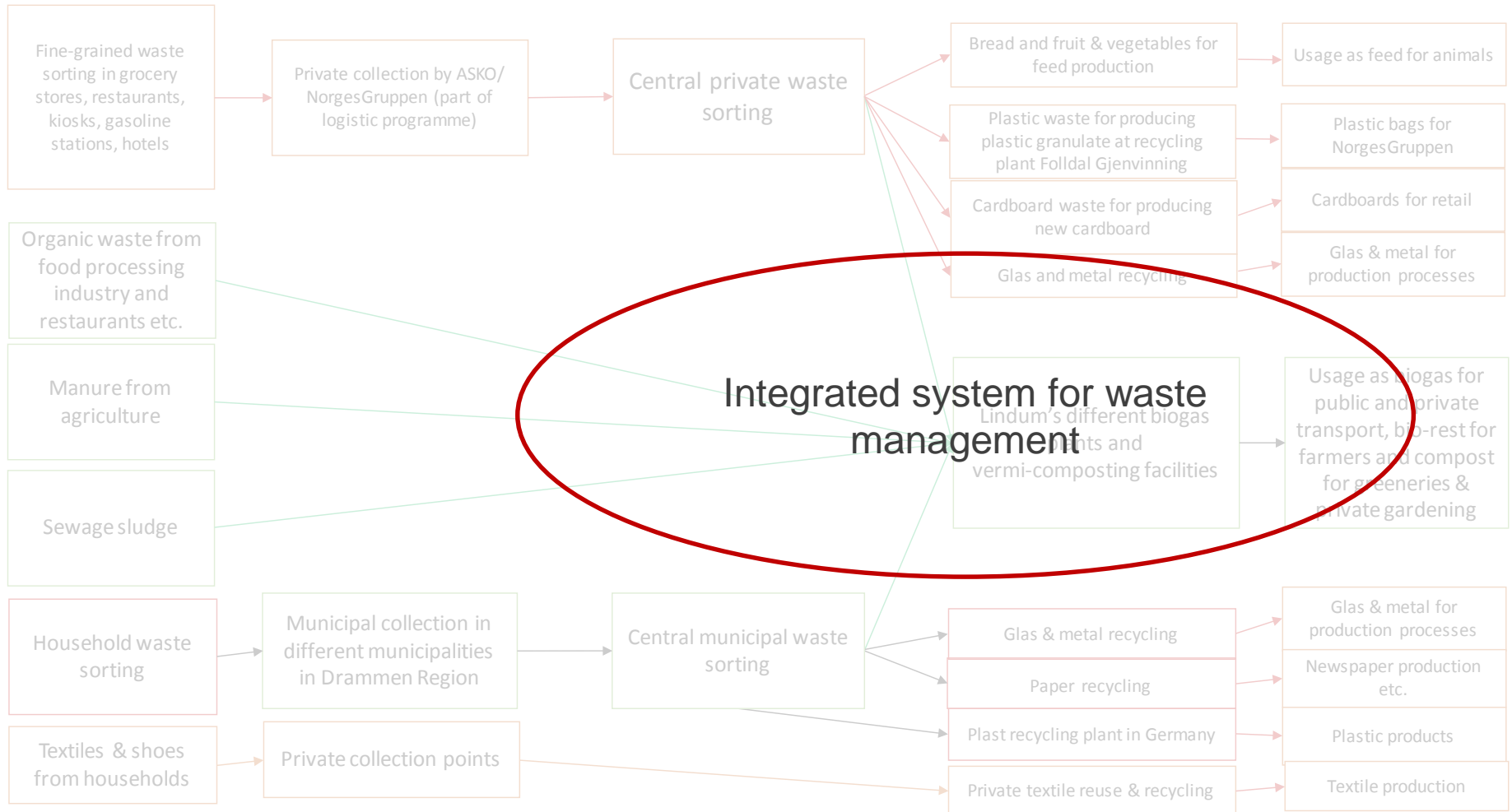
# The Drammen case

- Transition agent and central driving force: Lindum AS (Publicly owned enterprise) with activities all-over Southern Norway
- Regional collaboration with inter-municipal waste management agency
- Integrated public and private sector systems of waste management
- Gives more possibilities regarding bioresource (inputs) and products
- Exploiting synergies with other regions and across sectors
- Incentives for pro-active development of innovative solutions for food waste prevention
- Using compost in local greeneries and on citizens' roofs and balconies

# The Drammen case: Public & private sector integration



# The Drammen case: Public & private sector integration



# Tentative findings

- **Entrepreneurial state and directionality:** Both cases involves an active public sector setting the direction for change (Mazzucato 2013; Weber & Rohracher 2012) – but with different incentives for innovation
- **Coordination in socio-technical transitions:** Legal structures and incentives makes the Drammen case more integrated as it may draw upon inputs from and outputs to a broader set of actors across both public and private sector > More robust and dynamic model > Coordination across sectors (Weber & Rohracher 2012)
- **Demand in socio-technical transitions:** In Drammen case the inhabitants / consumers involved in circular life cycle > Ensures greater engagement, understanding and motivation?
- **Circular economy:** Waste recycling versus waste prevention in the circular economy (Mourad 2016): Different modes of sustainability in the two cases > Points to relevance of incentives for transition agents and action space for governance



# Governance for a circular bioeconomy

Oslo

Drammen



# Tentative conclusions...

- Common challenge for both case
  - Integrated and intersectoral
- Different governance models
  - Different transition agents with various incentives
- Gives different innovation dynamics in the two cases; System optimization/ Innovation system (Oslo) vs system change (Drammen)
- Governance systems in socio-technical regimes: Optimization within boundaries and given mandates or incentives for system change? Waste management > Eco-designs and waste avoidance / prevention
- Flexible designs in urban infrastructure > flexible governance designs?

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