ARBOR’s strategy recommendations & fields of interventions on bioenergy acceleration in NWE

Daniel Koster

Luxemburg Institute of Science and Technology
Agenda

- Biomass in EU / NWE: objectives and state of the art
- Strategy development (within the ARBOR Project)
  - Involving stakeholders (NTAFs / TAB)
  - Strategic guidelines / strategic aspects of the pilots
- The ARBOR Case study -> lessons learned
  - Strategic outcomes for biomass from municipalities
  - Strategic outcomes for biomass from agriculture
  - Strategic outcomes for biomass from nature conservation
  - Biomass for the circular economy
EU: objectives and state of the art

- **National Renewable energy action plans – objectives / progress**
  
  (COM (2013) 175 final)

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<th>France</th>
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<td><strong>2020</strong></td>
<td>13%</td>
<td>23%</td>
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<td>14%</td>
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**Sectoral and overall growth of renewable energy in the EU**

Source: Eurostat
EU: objectives and state of the art

- NREAP – Renewable energy progress in total

Planned (blue) versus estimated (red/dotted) trend in EU renewable energy
Source: European Commission (COM (2013) 175 final)
EU: objectives and state of the art

- NREAP – Biomass energy progress

Planned (blue) versus estimated (red/dotted) trend in EU biomass energy
Source: European Commission (COM (2013) 175 final)
EU: objectives and state of the art

State of play & Trends

- **Forestry biomass**
  - only slight growth: 71 Mtoe (2012) → 73.6 Mtoe (2020)
  - major increase in past years
  - mainly direct wood supply, minor residues

- **Agricultural biomass**
  - significant growth: 13.2 Mtoe (2012) → 41.7 Mtoe (2020)
  - mainly residues & by-products

- **Biodegradable waste**

State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU
Source: European Commission (SWD(2014) 259 final)
ARBOR – a strategic initiative project

- Stakeholder involvement & communication
  - Assure stakeholder involvement -> relevance of our work for their challenges
  - Communicate “lessons learned” to be taken up by the stakeholders
ARBOR – a strategic initiative project

- ARBOR NTAFs & TAB
  - 38 national Taskforce meetings

- 3 TAB meetings
  - Energetic valorization of low impact biomass from agriculture and nature protection areas
  - Digestate Valorization and Nutrient Recycling
  - Organic waste streams in responsibility of public authorities

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<td><strong>6</strong></td>
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Strategy development within the ARBOR Project

Strategic guidelines

- The material dimension
- The energy market dimension
- The technical dimension
- The socio-political dimension

Strategic aspects of the pilots (related to their transferability & implementation)

- Necessary economic framework conditions
- Technical state of play
- Legal and administrative environment
- Environmental aspects and sustainability
From case studies to strategic outputs

- Biomass from **municipalities**
  sewage sludge / biogenic waste / greenery cutting

- Biomass from **agriculture**
  agricultural residues / considerate exploitation of arable land

- Biomass from **nature conservation**
  woody and gras like materials

- Biomass for the **circular economy**
  circular nutrient management / synergy parks
Development of closed loop systems of biomass valorization by local authorities- Organic household waste and greeneries

- **Goals, set by EU:**
  - Waste Framework Directive: 50% recycling of household waste in 2020
  - Renewable Energy Directive: 20% sustainable energy in 2020, 27% in 2030
  - Landfill directive: reduction of landfilling valuable resources

- **Target:** Shifting the General Public Disposal Order into resource efficient supply services by local authorities and private sector
  - Transition to a Circular Economy and contribute to Sustainable Growth
  - Contribution to Low Carbon Society (provide a high GHG reduction potential)
  - Does not exacerbate land use competition
  - Provide high resource efficiency energy production & material products- as quality assured fertilizers
Large differences in NWE Member States implementation

- **Separately collection** of organic waste is mostly not mandatory
- Legal **standards for organic waste treatment** are not prescribing **energy** recovery
- Legislative **restrictions for the application of organic waste** on agricultural land
- Certification systems for **quality assurance** for treated organic waste products are mostly voluntary
- **Extra incentives** for electricity and or heat generation from organic waste are partly implemented
Saarland Case Study Aim
Respond to heterogeneous greenery recycling concepts and export of organic waste from households

Saarland Strategic Recommendations
• Legal amendment to *increase material and energy efficiency standard* for greenery cutting treatments (herbal and wooden biomasses)
• Political drive to *increase regional recycling* of organic waste from household in Federal State Saarland
• **Cross-border synergies** with the French region of Lorraine
• Decentralised collection and recycling hubs
• Option: Saarland anaerobic digestion (AD) plant for combined bio-waste
• Wooden greeneries for near district heating systems (min. 500 kWth or ORC)
• Innovation: Integrated pyrolysis / HTC at AD for biochar production

*Development of closed loop systems of biomass valorization by local authorities - Organic household waste and greeneries*
General Recommendations for NWE

- **Separate collection** systems for organic household wastes and greeneries -> quality standard compost/ digestate

- Biogas technology as multifunctional service provider
  - Change in waste legislation (*recycling standard*) or adjust *incentive systems* for waste to energy conversion

- Greenhouse gas abatement, resource efficiency criteria in *public tender systems*

- Wooden greeneries to be combusted in *more efficient heating systems* with district heating grids
Goals, set by EU:

- Sewage Sludge Directive
- Waste Framework Directive
- Consultative Communication on the Sustainable Use of Phosphorus

Target: Sewage sludge as a resource

- Recycling
- Sustainability
- Protection of resources
- Resource efficiency
Saarland Case Study Aim

- Respond to the future legal ban on direct agricultural appliances (Avoidance of polymers, heavy metals)

Saarland Case Study Scenarios

- Decentralised thermo-chemical processes for phosphorus recycling, biochar fuel production
- Mono-Incineration for phosphorus recycling, electricity production and heat recovery
- Cross-border synergies with the GRAND REGION “SaarLorLux”
General Recommendations for NWE

- The waste water sector needs **legal certainty:**
  - agricultural appliance, P-recovery technologies
  - Interlink waste, soil protection and waste water regulations

- **Quality standard** for soil application restrict agricultural appliances
  - Removal of contaminants as fertilizer (HM, Hygiene);
  - Characteristics of final products by quality assurances

- **Trend: Resource management** is gaining importance
  - Phosphorus recovery technology is not yet established: a period of transition is necessary
  - Flexible solutions are necessary, as *thermo-chemical conversion* processes (material, energy)
Biomass originating from agricultural activities

Agricultural residues
- **Bioenergy** potential outside the competition for land
- collection of residues can **reduce environmental impacts** of nutrient leaching
- Vegetable residues → low DM content / biogas yield → high collection costs → **financial support necessary** to mobilize those impact reductions
- Valorisation through **bio-based industry** a matter of scale
- **Technical challenge**: harvesting & collection
- **Legal hurdles** might complicate the exchange of residues in between stakeholders
- Opportunity: pocket digester (for manure)
Biomass originating from agricultural activities

Considerate exploitation of arable land

- **Multi-functional SRC** (unused industrial land)
  - Biomass production for internal use
  - demonstrate “green thinking”
  - Natural buffer enables odour- or particulate matter emission reductions & increases biodiversity
  - Requirements of communes need to be adapted

- **Multi-functional SRC in agriculture**
  - SRC on free range chicken farm: odor reduction, biodiversity effects, SRC profit from poultry manure, benefits for animal welfare, biomass (energy) production (avoiding competition)
  - Farmers are reluctant (lack of knowledge, predators, wild birds)

- **Biomass from contaminated soils**
  - Valorisation of the material - Legal status unclear: depending more on valorisation chain
  - Focus more on fixation and proper use of the land than on remediation
Biomass originating from agricultural activities

Considerate exploitation of arable land

- **Buffer strips**
  - Considered in CAP as ecological focus area / Harvesting prohibited
  - Additional income from energetic use of harvested material often not sufficient

- **Cover crops**
  - Considered in CAP as ecological focus area (harvest time predefined / no pesticides)
  - additional effort (and to minor extent additional risk) needs to be balanced by economic added value
Biomass originating from nature protection

**Current situation:**
- Originated by nature protection measures (waste)
- Low quantities, low qualities (lignin-content, low methane content)
- Hard to mobilize: decentral places of origin
- Material is mainly used as fodder or as litter in livestock farming
- Energetic mobilization via German Renewable Energy Act
  - Highest feed-in tariff, but wide definition of landscaping materials (2004-2010)
  - But only one dry-fermentation plant running with exclusively landscaping material (BUND)
  - EU project Combine research

**Recommendation:**
- Mobilization of wooden material for combustion purposes
- Mobilization of herbal material no priority AD purpose
Biomass streams in the “circular economy”

Circular nutrient management

Long-term projections for global NPK supply
Source: Blanco 2011 – based on FAO data & projections by Blanco

Price of urea and natural gas in Europe
Biomass streams in the “circular economy”

Circular nutrient management

Review on critical raw materials by importance and supply risk for the EU
Source: EU Commission DG ENTR 2014 – report on critical raw materials for the EU
Biomass streams in the “circular economy”

Circular nutrient management
- Nutrient surpluses in regions with intense livestock breeding → impacting surface and ground water quality
- Nitrate directive → vulnerable zones / restrictions by the local authorities
- Digestate - limiting factor for biogas development

- *Treating digestate* to export (or get access to new markets) or gain a mineral fertilizer became an obligation for parts of the digestate streams in some regions

- Overview manure/digestate treatment technologies: www.arbornwe.eu/downloads
Circular nutrient management

- **Technical solutions** are available, the expected end product and situation on site defines the technique

- **Standardisation / certification and quality control** necessary to reach reliable, stable product compositions and increase market acceptance

- **Legal constrains**: bio-based fertilizers are legally considered organic fertilizers, regardless their character and limiting their use

- Choice of site (centralized / decentralized) decides on availability of excess heat and electricity from biogas CHP – strong impact on economics and **environmental performance**. Treating digestate locally decreases environmental impacts in any case, compared to direct spreading
Biomass streams in the “circular economy”

Synergy parks based on biogenic secondary raw materials

- Circular economy: “waste is food”
- **Bottom up development** – what can planners / authorities do?
- Authorities can try to increase trust in concepts and in between companies through exchange
- Reluctance in accepting **long term contracts**:
  - share risks for joint investments (e.g. exchange infrastructure / backup capacity)
  - **Intercommunal companies** as partners (regional bounded / social responsibility)
  - Material / energy exchange should be (monetary) **contractual secured** – even if residual
- **Management**: get insider with entrepreneurial thinking as “park manager”
- **Legal hurdles**: “end of waste criteria” / “waste vs. product” issue can be solved

Biobased exchanges in Biopark Terneuzen, province of Sealand
Source: ARBOR Case study report – Synergie parks
Thank you very much for your attention!

Daniel Koster
daniel.koster@list.lu
www.list.lu