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

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arbor Biomass for Energy

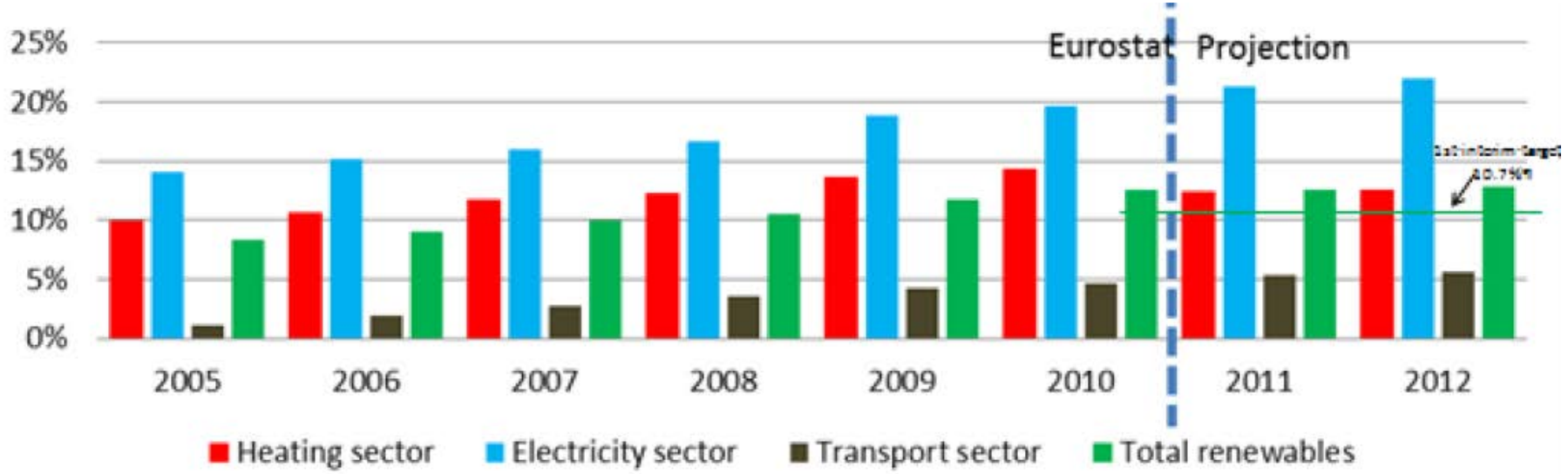
Agenda

- **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)

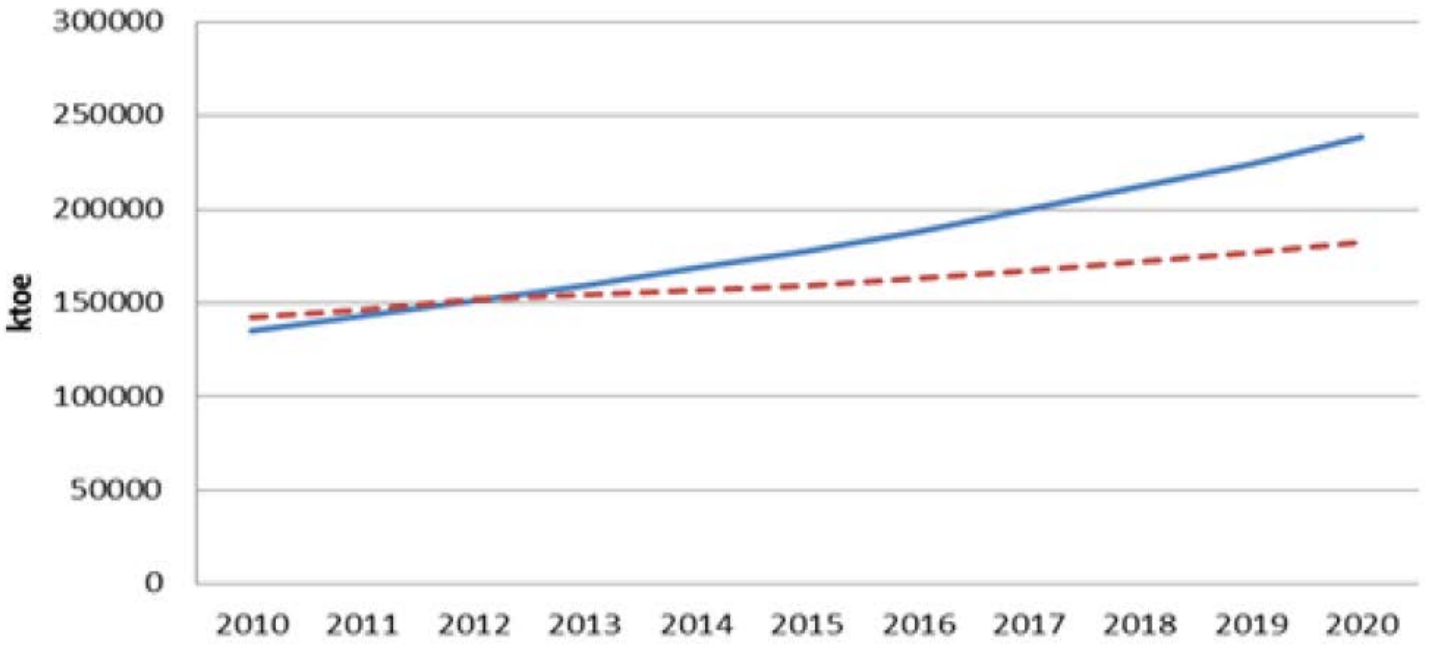
	Belgium	France	Germany	Ireland	Luxembourg	Netherlands	UK	Total
2020	13%	23%	18%	16%	11%	14%	15%	**20%**



Sectoral and overall growth of renewable energy in the EU
Source: Eurostat

EU: objectives and state of the art

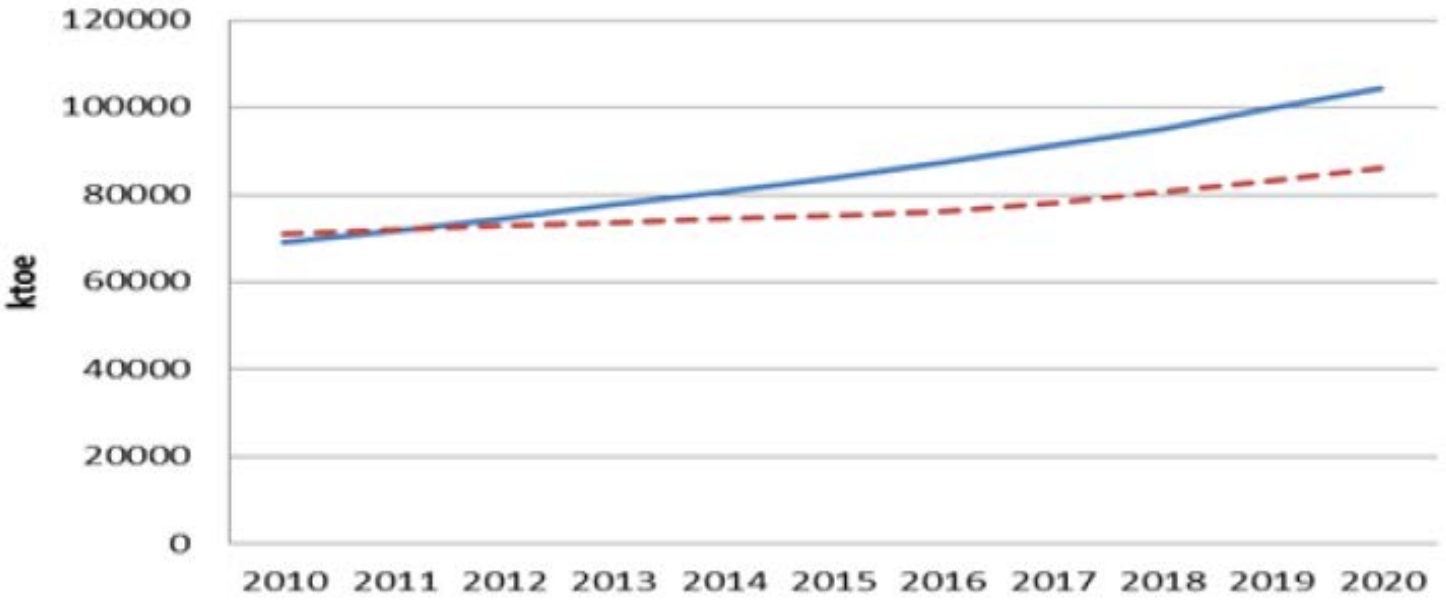
- **NREAP – Renewable energy progress in total**



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**

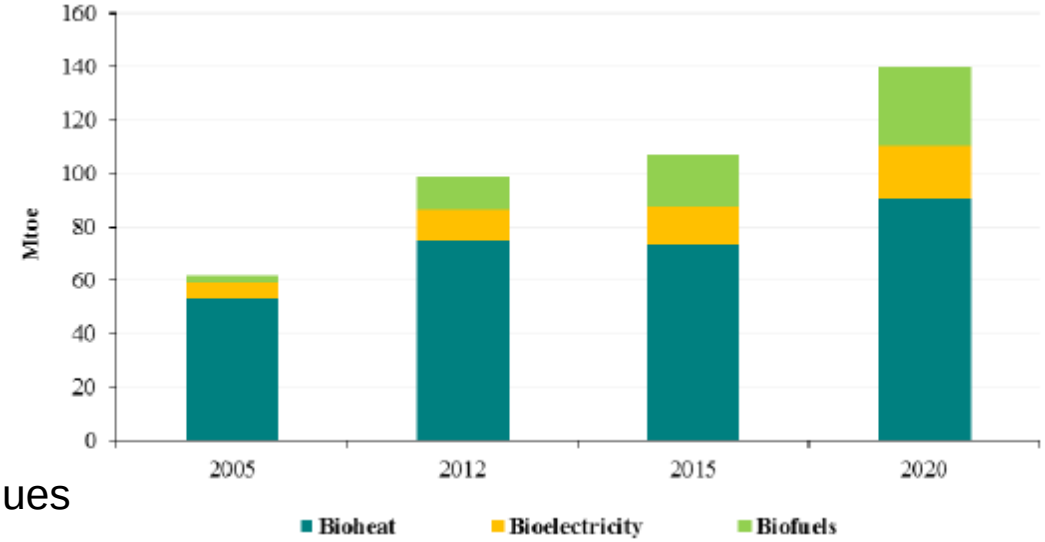


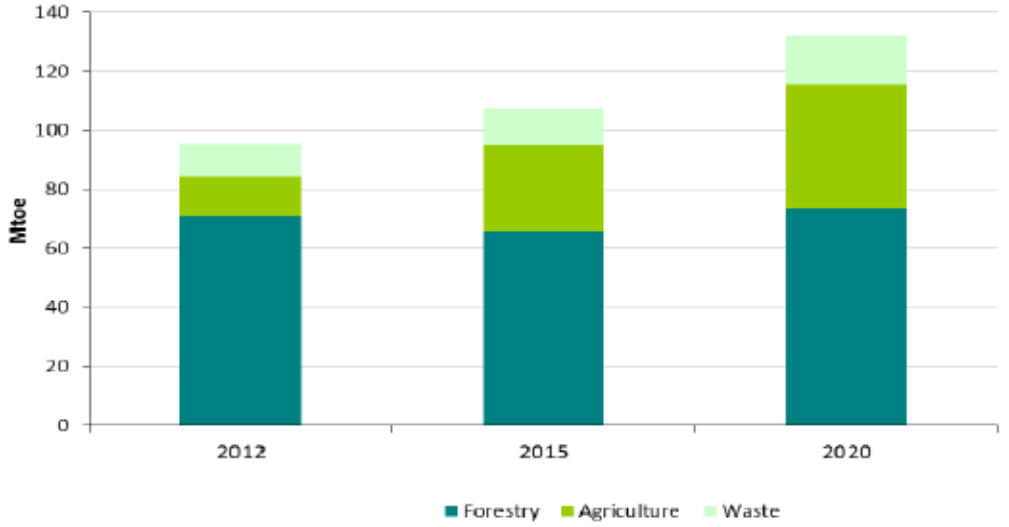
Planned (blue) versus estimated (red/dotted) trend in EU biomass energy
Source: European Commission (COM (2013) 175 final)

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**
  - moderate growth:
    10.8 Mtoe (2012) → 16.7 Mtoe (2020)

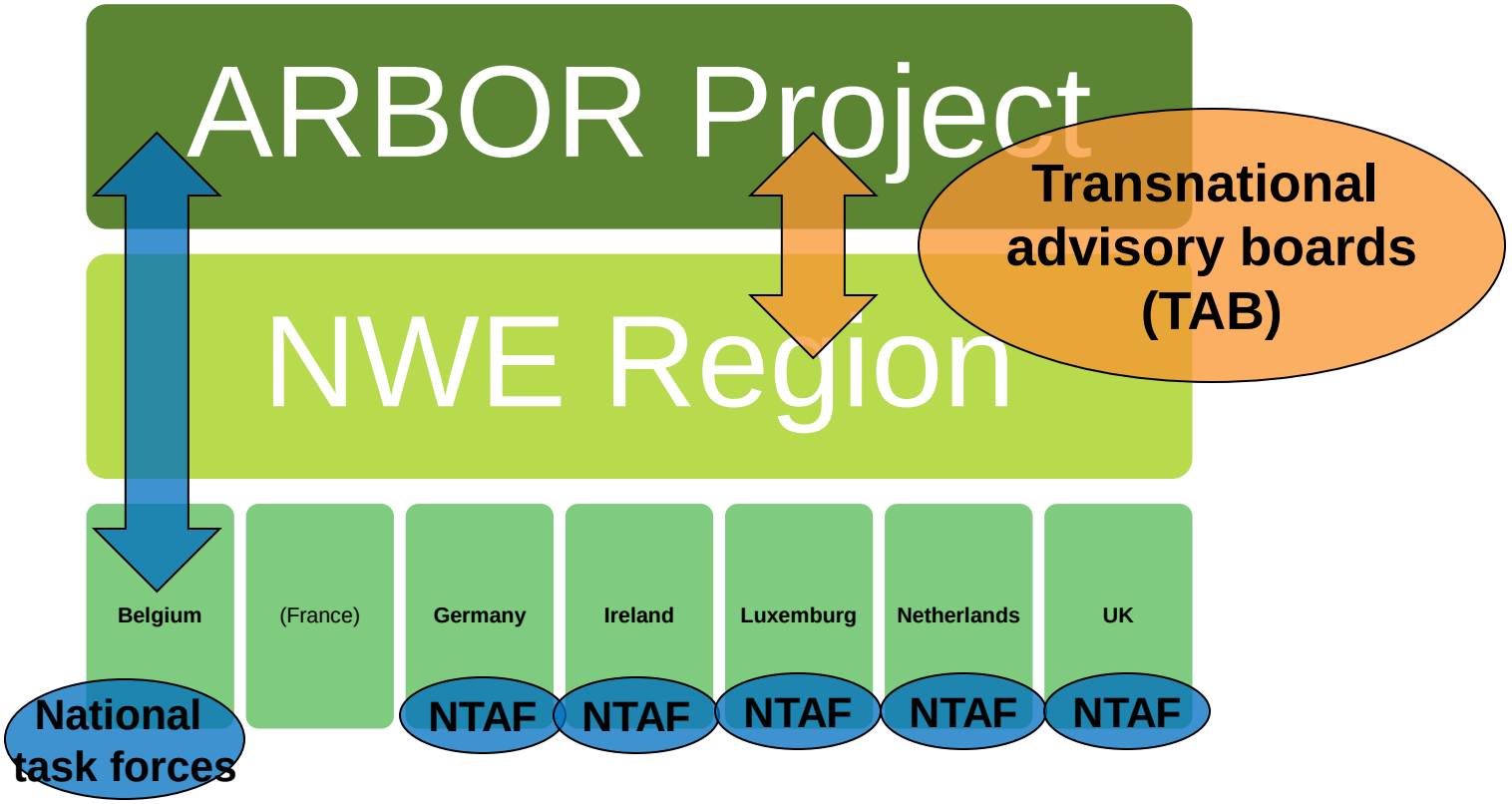




State of play on the sustainability of solid and gaseous biomass used for electricity, heating and cooling in the EU
Source: European Commission (SWD(2014) 259 final)

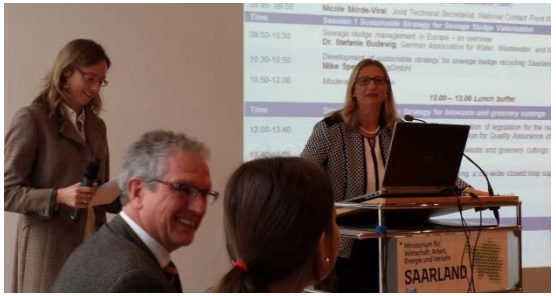
ARBOR – a strategic initiative project

- **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



	Belgium (Flanders)	Netherlands	UK	Germany	Ireland	Luxembourg	Total
2012	2	3	1	4		1	**11**
2013	2	3	1	8	1	1	**16**
2014	2	2	1	6			**11**
2015				2	1		**3**
Total:	**6**	**8**	**3**	**20**	**2**	**2**	**38**

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

- **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




Development of closed loop systems of biomass valorization by local authorities- Organic household waste and greeneries

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

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




Development of closed loop systems of biomass valorization by local authorities- Sewage sludge

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

Development of closed loop systems of biomass valorization by local authorities –Sewage sludge

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, bio char fuel production
- Mono-Incineration for phosphorus recycling, electricity production and heat recovery
- Cross-border synergies with the GRAND REGION “SaarLorLux”

Development of closed loop systems of biomass valorization by local authorities –Sewage sludge

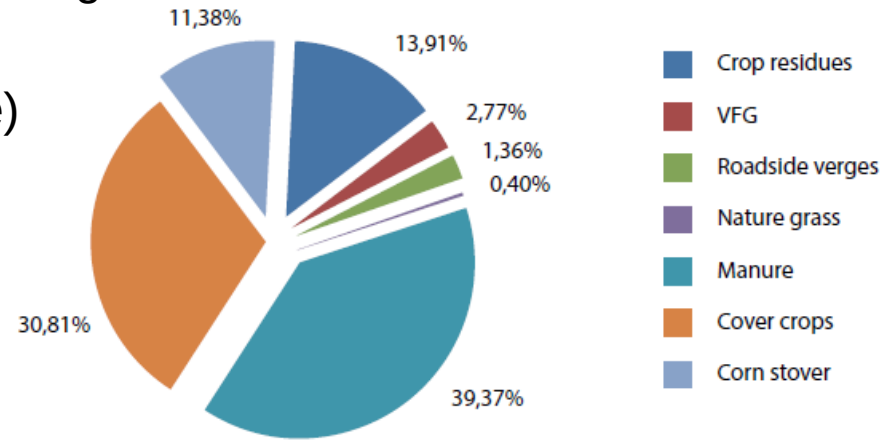
General Recommendations for NWE

- 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 ***reduces environmental impacts*** of nutrient leaching
- Vegetable residues → low DM content / biogas yield → high collection costs → ***financial support necessary*** to mobilized those impact reductions
- Valorisation though ***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

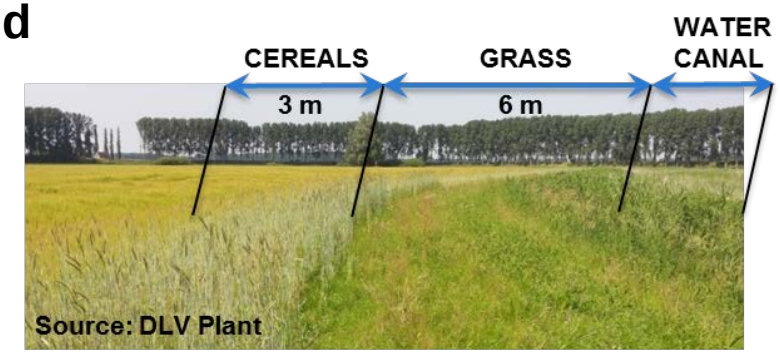
Considerate exploitation of arable land

- **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

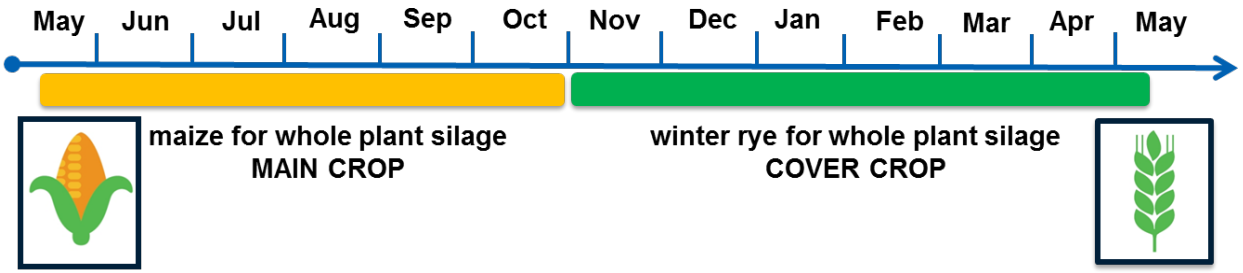
Biomass originating from agricultural activities

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:

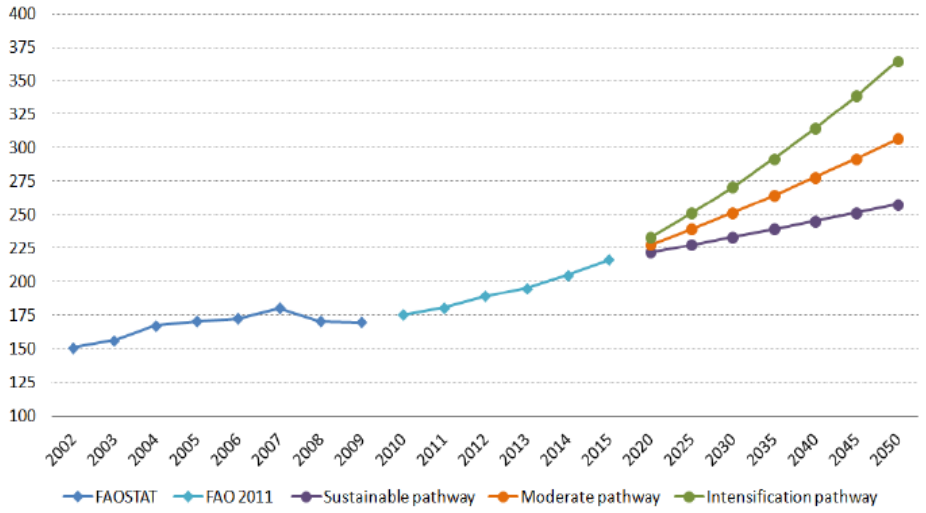
- Originated by nature protection measures (waste)
- Low quantities, low qualities (lignin-content, low methane content)
- Hard to mobilize: decentral places of origin
- Material is mainly used as fodder or as litter in livestock farming
- Energetic mobilization via German Renewable Energy Act
  - Highest 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:

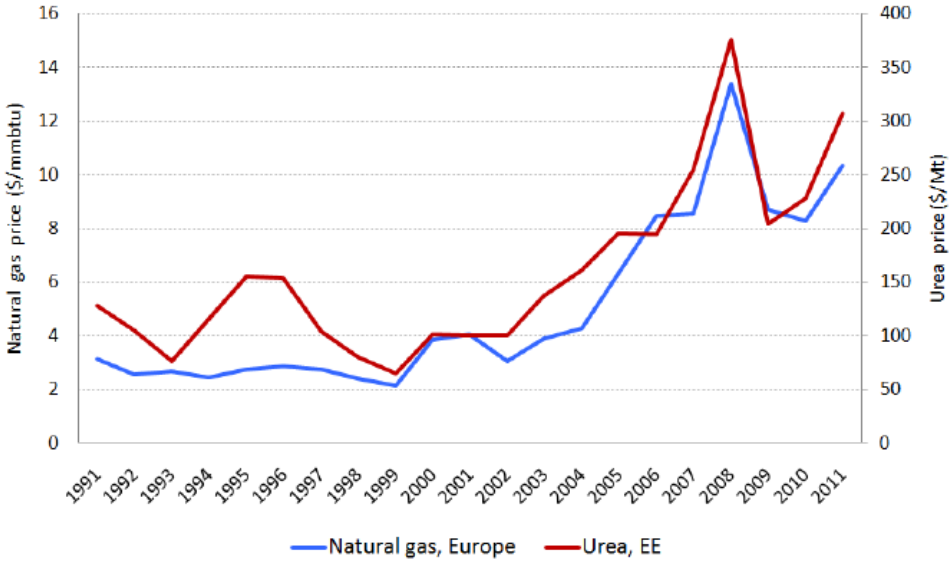
- Mobilization of wooden material for combustion purposes
- Mobilization of herbal material no priority AD purpose

Biomass streams in the “circular economy”

Circular nutrient management



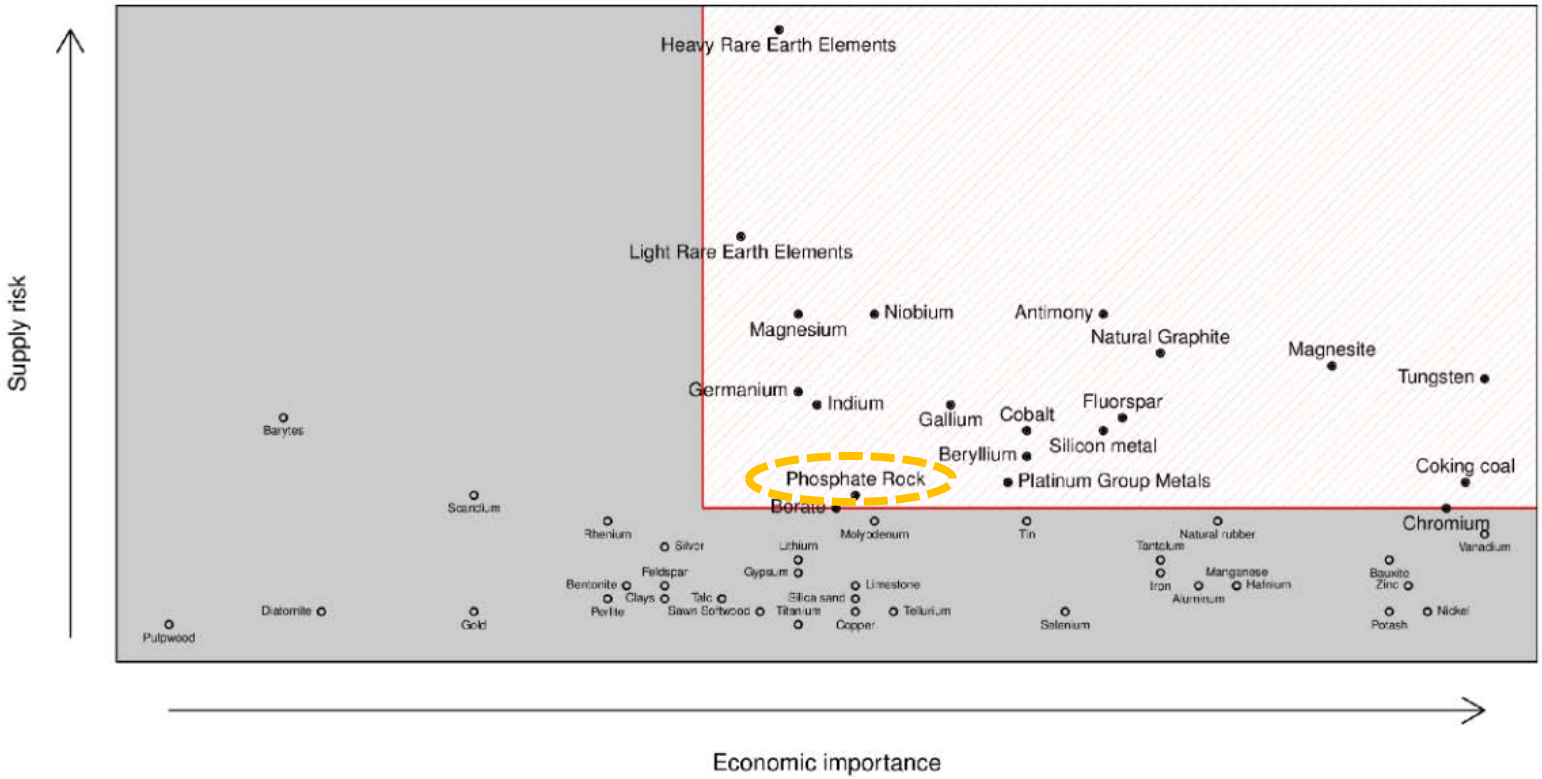
Long-term projections for global NPK supply
Source: Blanco 2011 – based on FAO data & projections by Blanco



Price of urea and natural gas in Europe
Source: Blanco 2011 – based on World Bank database 11/2011

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

Biomass streams in the “circular economy”

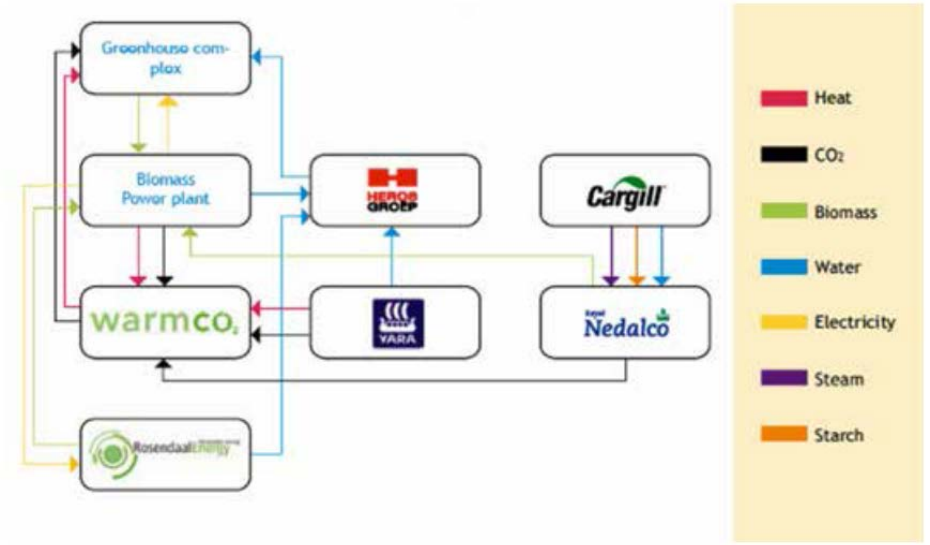
Circular nutrient management

- **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



Biobased exchanges in Biopark Terneuzen, province of Sealand
Source: ARBOR Case study report – Synergie parks

- 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

Thank you very much for your attention !

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