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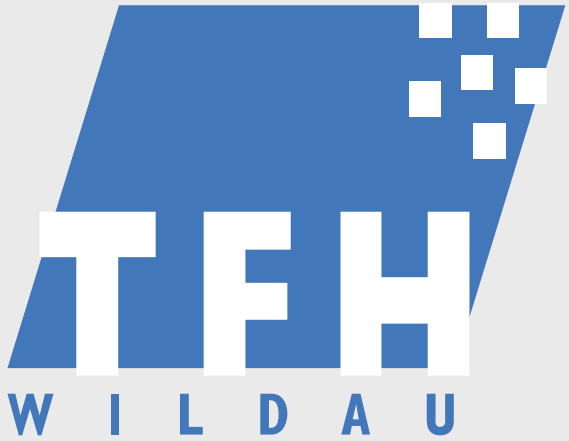

Integrated Biomass Supply Logistics – the MIRO Model

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Eberswalde, 05.06.2007

Topics

- Project Background
- Biomass Procurement Systems
- The MIRO Model – Functions and Planning Options
- Conclusion and Outlook

University of Applied Sciences - The Research Group Transport Logistics

Fields of Activities

- Intermodal Goods Transport
- Urban goods movement
- Transport telematics
- Logistics for Wood and Biomass

Recent Projects

- ECO4LOG – Intermodal Goods Transport in Central Europe
- INTERIM – Harbour-hinterland connectivity in CADSES area,
- OPERA – Forest Logistics and RFID Technology
- DENDROM – Supply Chains for Energy Wood
- MIRO – Integrated Biomass Procurement
- RÜFILOG – Traceability of Food with RFID
- MINERVA – Optimised Guidance of Trucks in Urban Areas

Project Background

- European Biomass Action Plan and Biofuel Strategy
- Second-generation biofuels → Fischer-Tropsch-biodiesel (BtL)

Large scale production of BtL:

- Importance of sustainable and cost-efficient feedstock supply (biomass + logistics)
- BtL as a new player in the market
- Competition for production areas and feedstock
- Development of new biomass sources

→ Design of supply systems

Requirement with respect to Biomass Supply

Requirements of future **BtL-producers**:

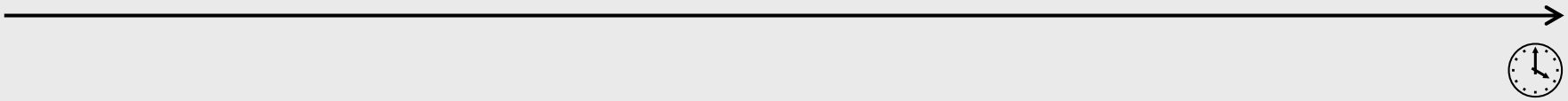
- reliable supply (high process times)
- continuous material flows (low storage costs)
- biomass products ← → production technology process (particle dimension, water content and chemical composition)
- flexibility and reliability of logistics

Requirements of **Society**:

- sustainability of biomass production and supply processes
- moderate traffic loads around the production location
- purchasing guarantees, fair prices

Set-Up of Supply Systems

Phase1: Strategic Planning	Phase 2: Detailed Planning	Phase 3: System Set-Up
• **analysis of framework conditions** • **conceptual planning of the supply system**	• calculation of needed capacities • make-or-buy-decisions • preselection of suppliers and service providers	• choice of suppliers • choice of service providers (logistics, processing) • contract conclusions



Characteristics of Planning Biomass Supply Systems

- Exchangeability of different biomass raw materials
- Various sources (geographical origin and suppliers)
- Seasonal availability of biomass raw and market development
- Current market prices and cost functions
- Options for designing supply chains (biomass treatment, intermediate products, container technology, vehicles and transport systems)
- Industrial workflow of BtL-production

Data Flow within the MIRO - Model

Input BIOMASS REQUIREMENTS

- plant location
- quantity
- biomass assortments

Data Basis

CALCULATION PARAMETERS

cost functions
- biomass production
- processing
- conditioning
- biomass upgrading
- logistics

availability of biomass
- seasonal biomass production
- mobilisation of farmers and forest owners
- alternative land use and biomass conversion routes

GEOGRAPHICAL DATA

- arable land and forests
- biomass potentials
- regional allocation of available biomass
- infrastructure

Planning DESIGN OF THE SUPPLY SYSTEM

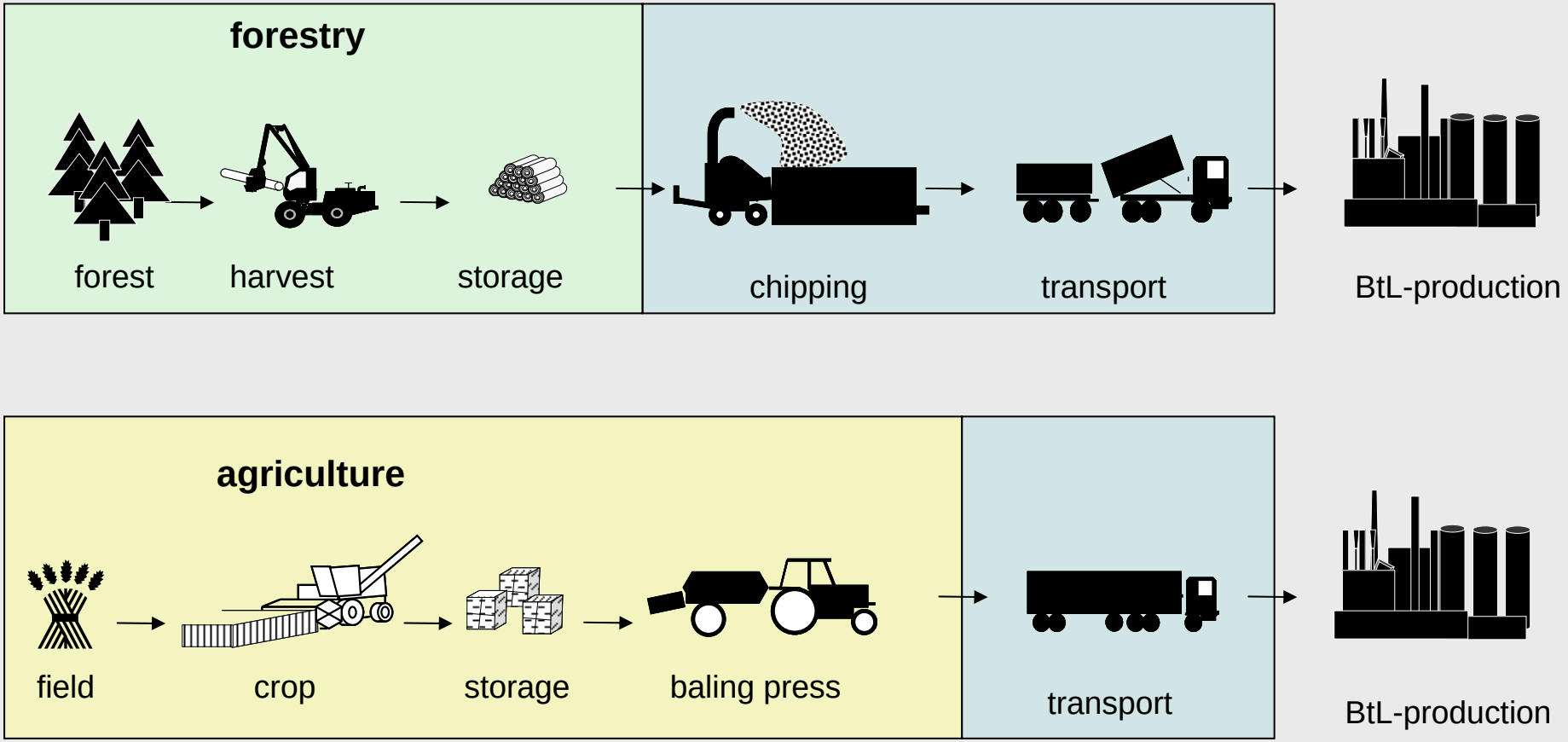
logistics chains
- processing, conditioning, upgrading
- transported goods
- storage
- transhipment
- means of transportation

transportation network
- network structure
- locations for biomass processing, storage and transhipment

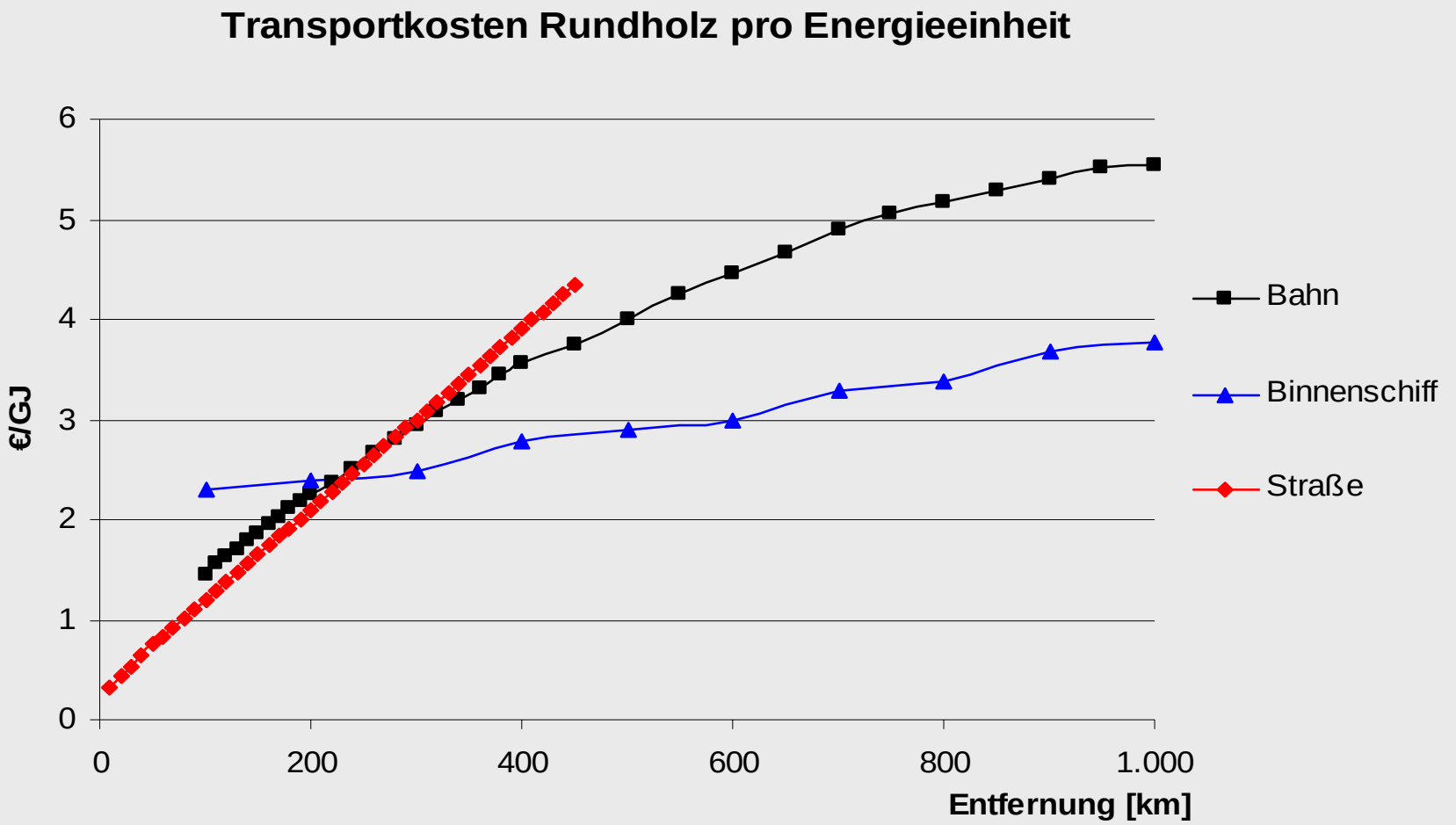
Result

overall costs of biomass supply

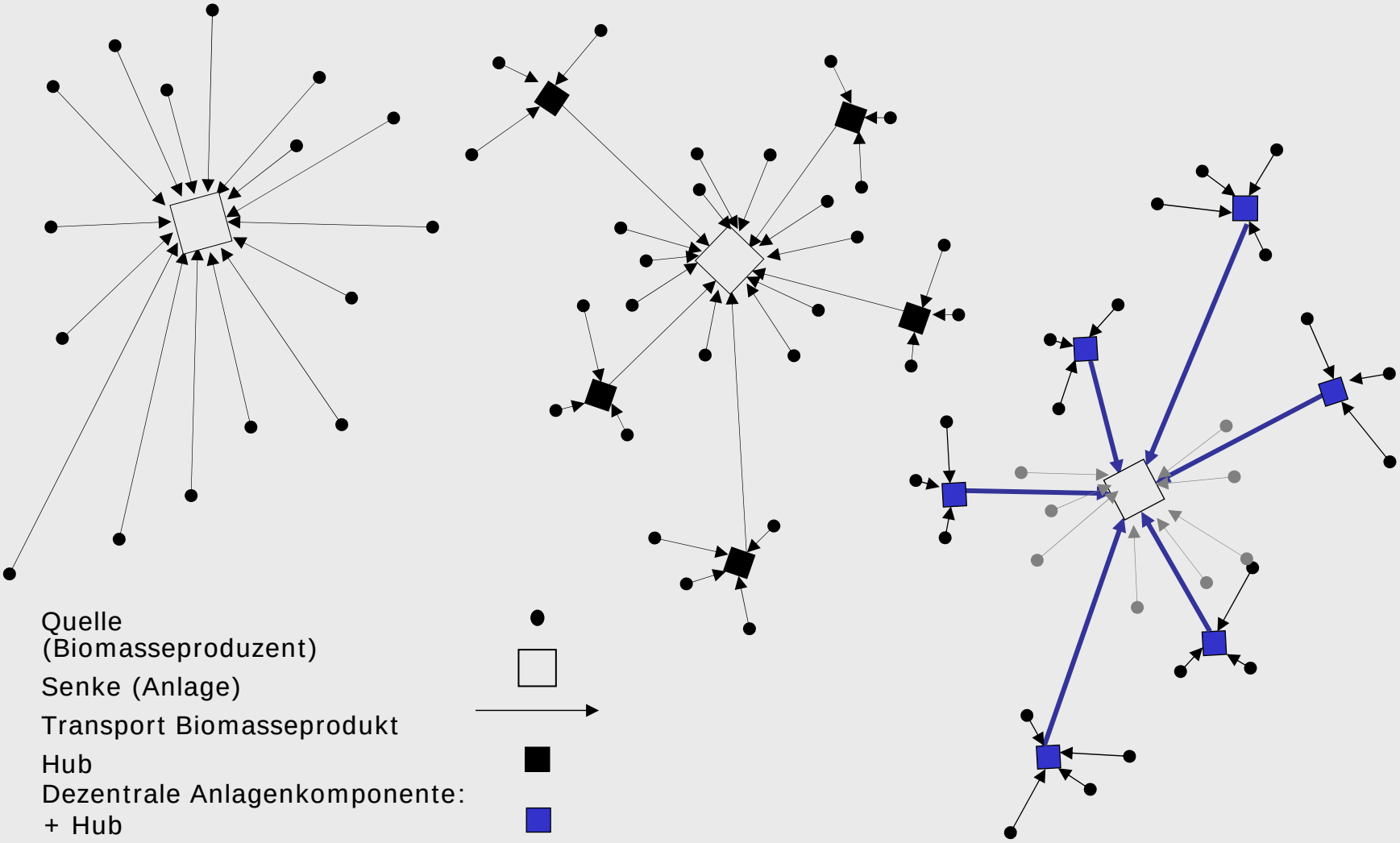
Supply Chains (1)
regional procurement of biomass



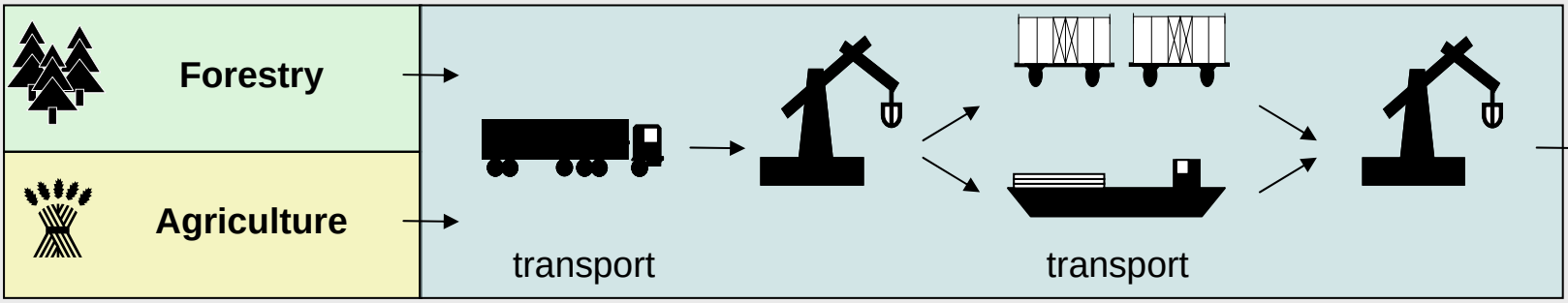
Supply Chains:
Distance depending choice of means of transport

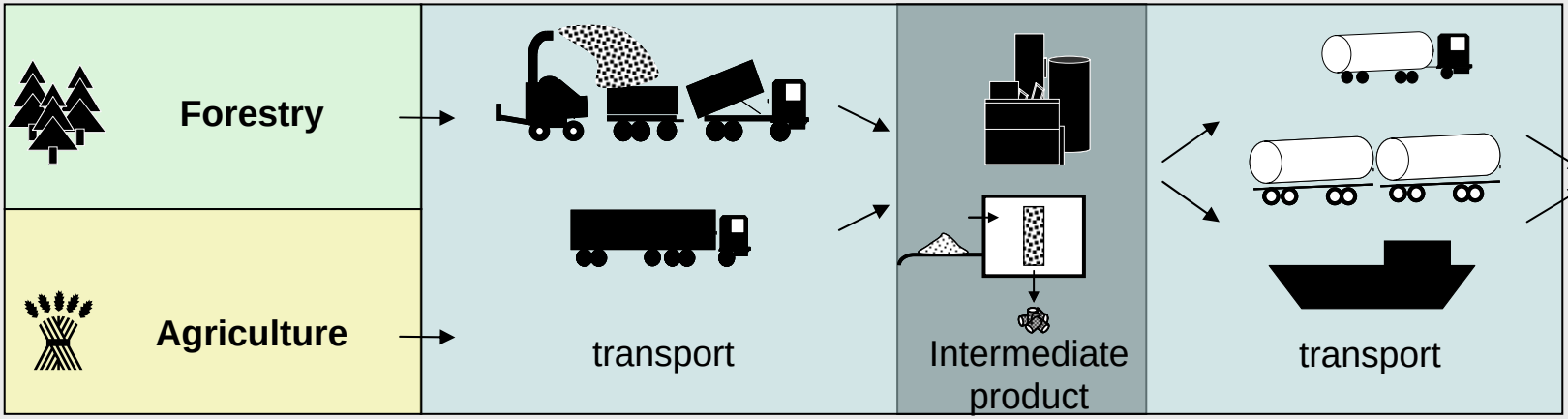


Structures of transportation networks for the procurement of biomass

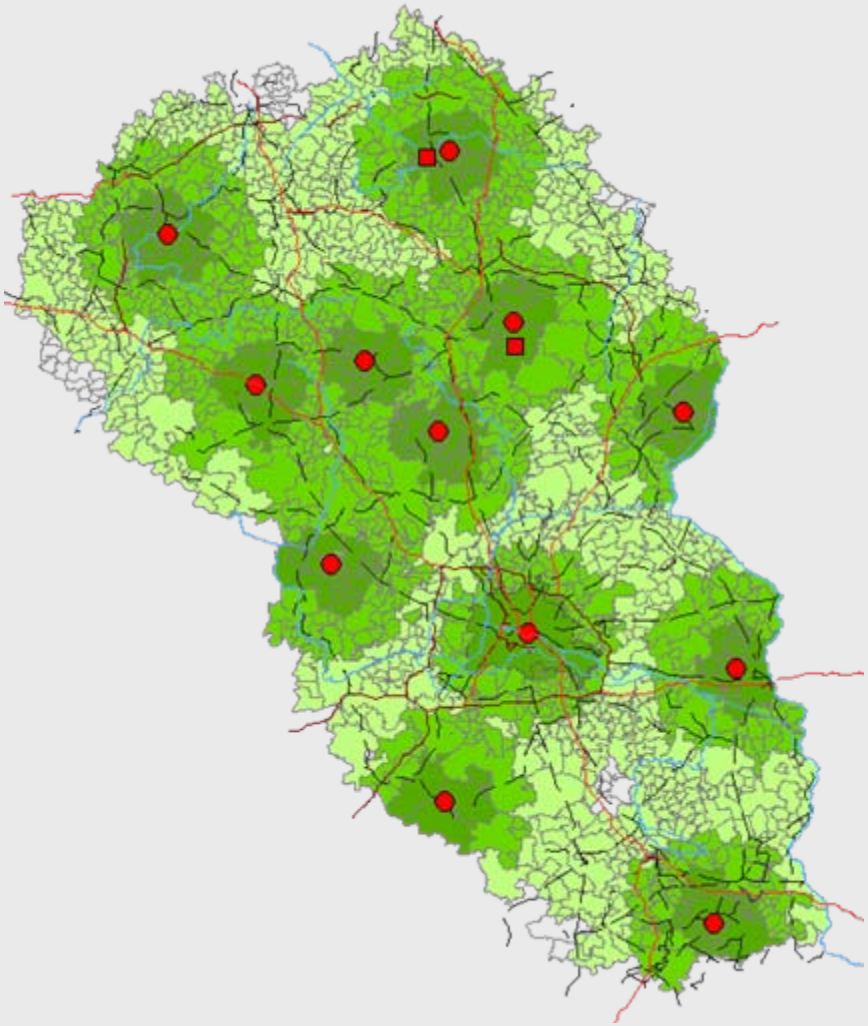


Supply Chains (2)
Supra-regional procurement of Biomass



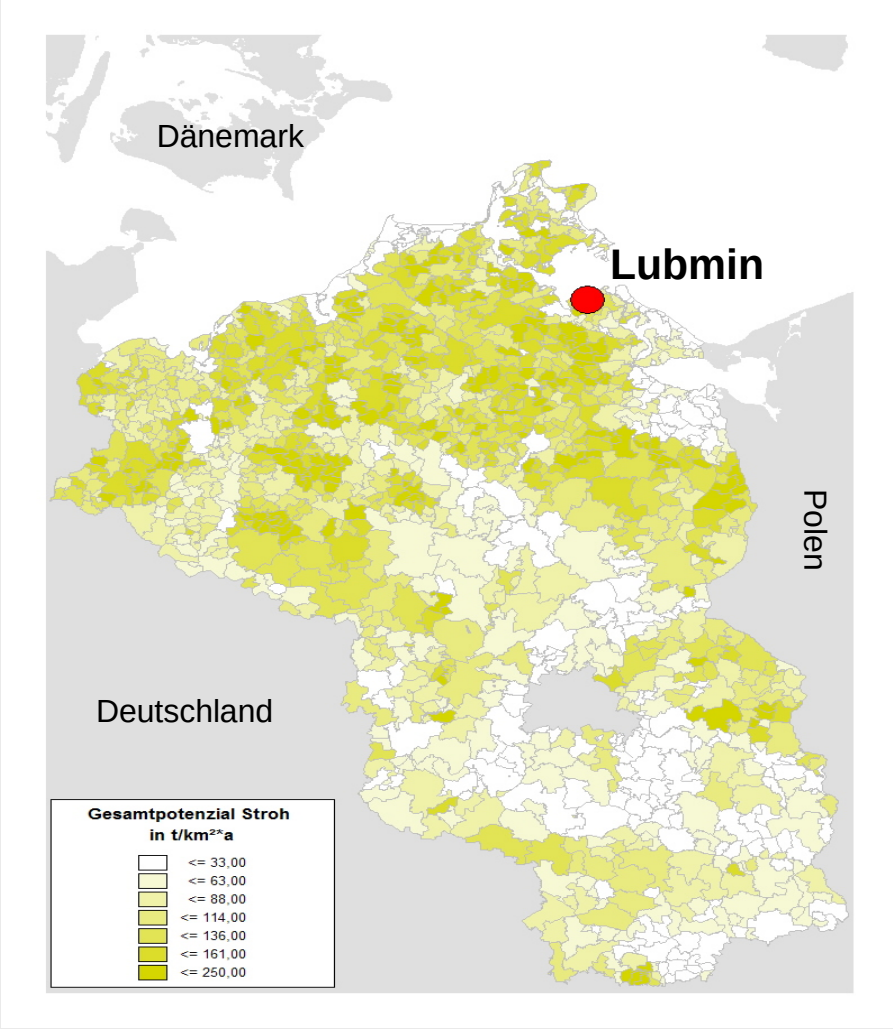


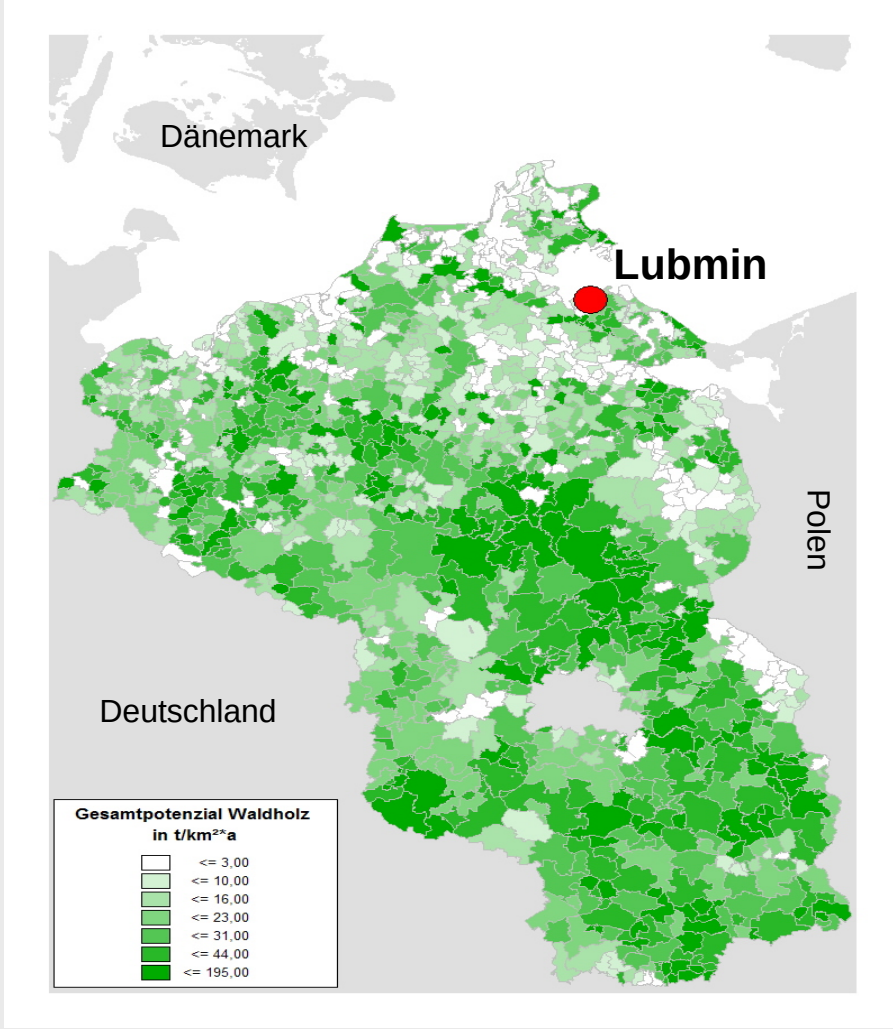
GIS-based model for the planning and rating of supply systems – procedure



- Auswahl einer Region
- Analyse der Infrastruktur
- Analyse der geographischen Verteilung von Biomassepotenzialen bzw. verfügbaren Mengen
- Ermittlung der (potenziellen) Abnehmer: Standort, Mengenbedarf, Anforderungen
- Ermitteln der Bezugsgebiete für Biomasse in Abhängigkeit des Bedarfs und der verfügbaren Mengen
- Festlegen von Bereitstellungsketten
- Ermitteln des Transportaufwands über verschiedene Verkehrsnetze
- Ermitteln des gesamten Bereitstellungsaufwands

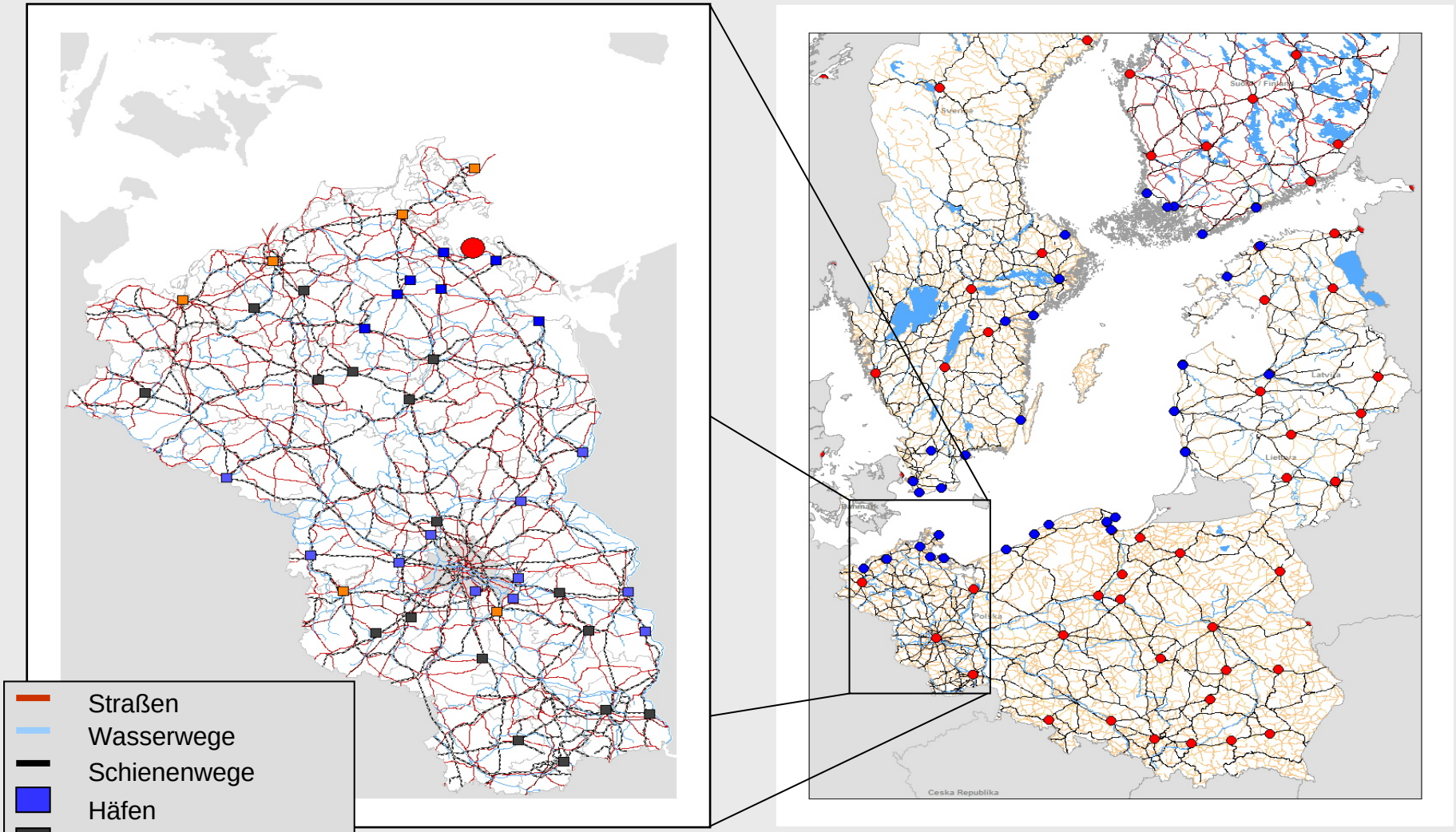
Regional biomass potential from forestry and agriculture



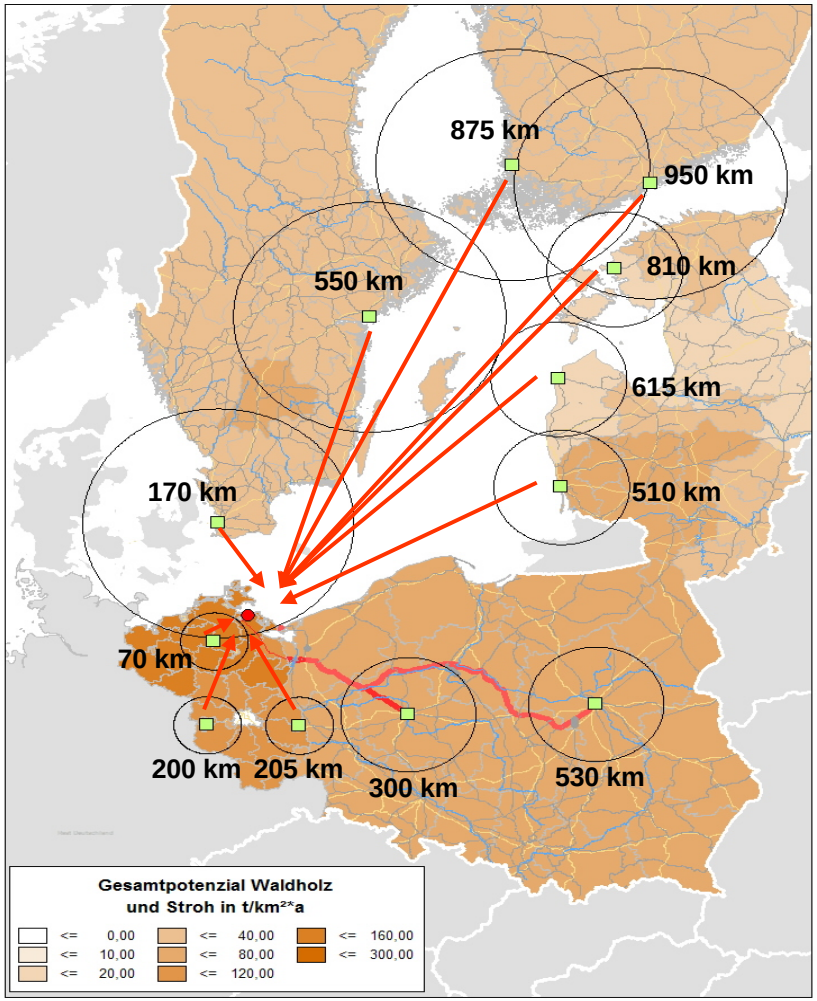


Datenherkunft: Brozio und Piorr, 2007; Muchin und Bilke, 2007

Transportation Networks: regional and international



Transportation options



Total cost of procurement depending on:

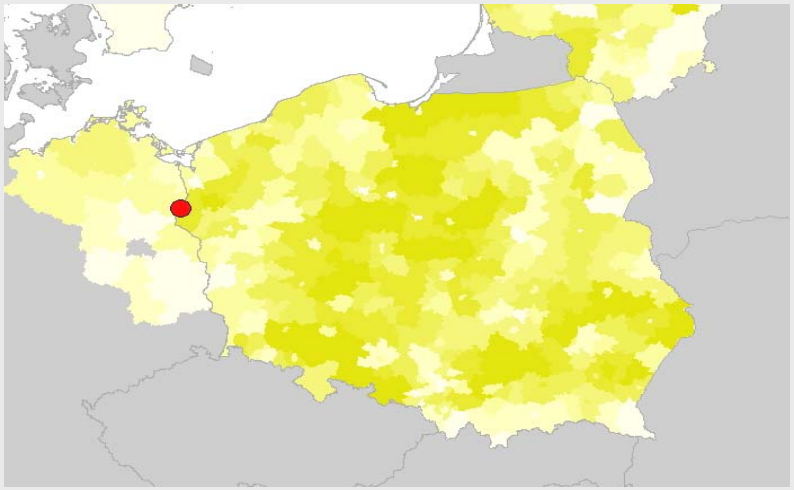
Material:

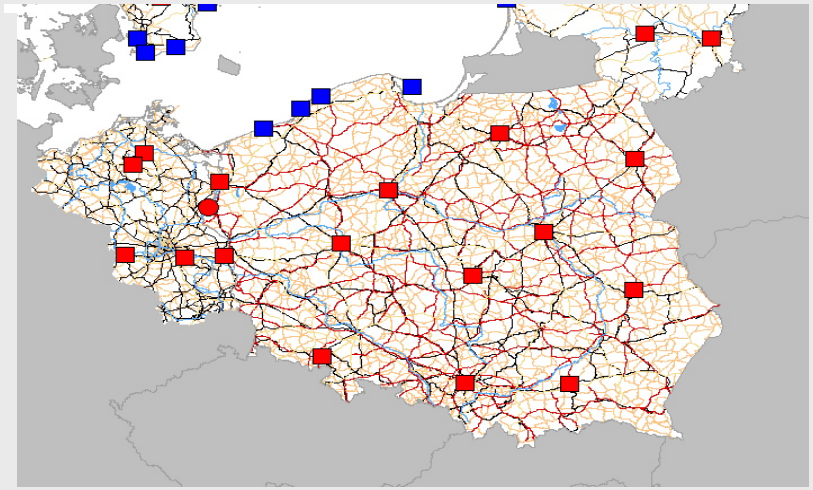
- biomass
- prize

Logistic costs:

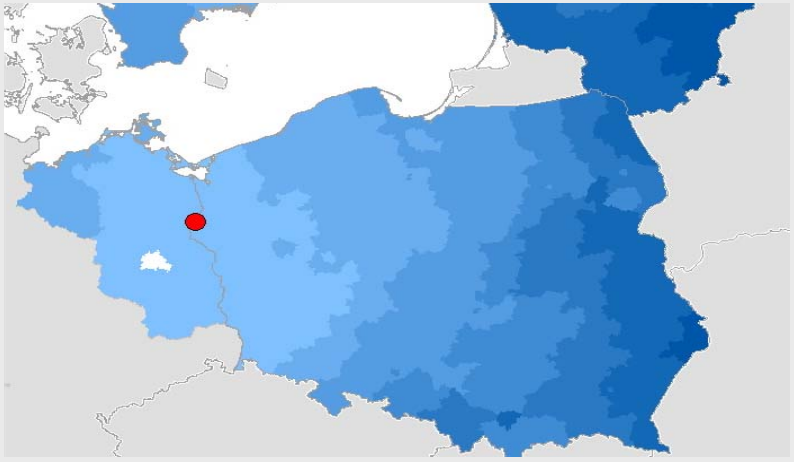
- raw material
- cargo
- mode of transport
- conditioning
- distance

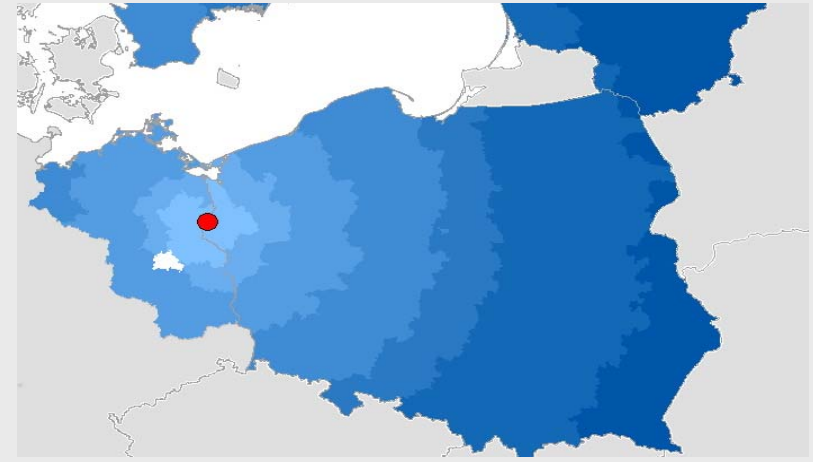
Planning Options –
Biomass Availability, Infrastructure, Biomass Prices



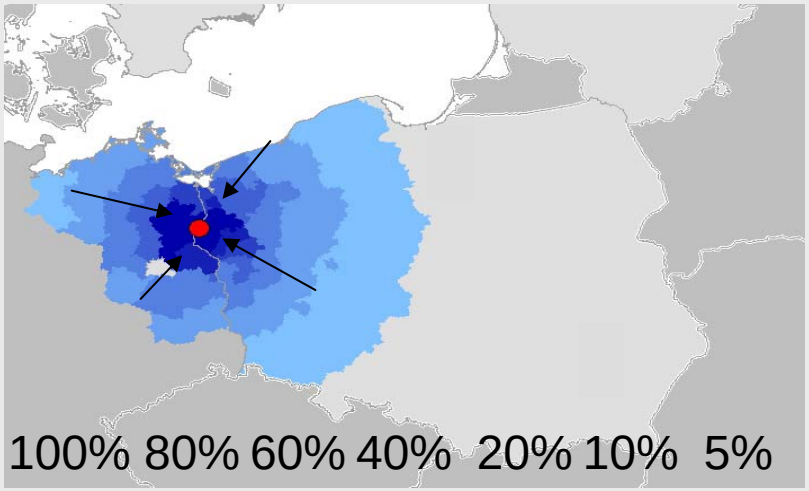


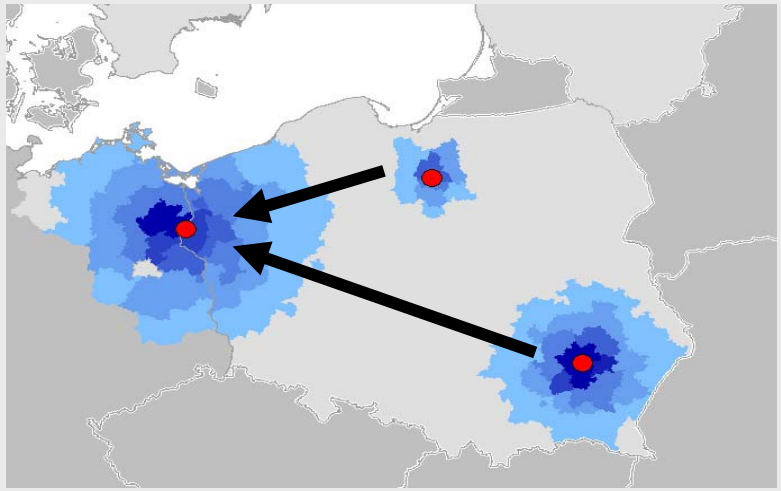
Datenherkunft: Brozio und Piorr, 2007

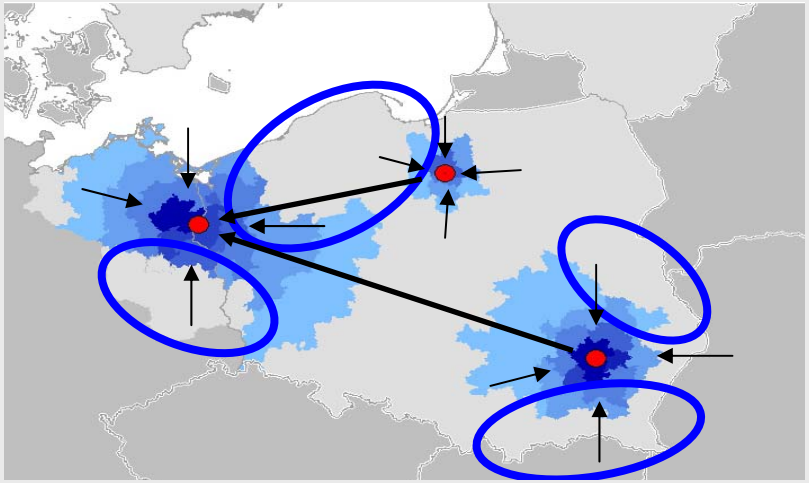


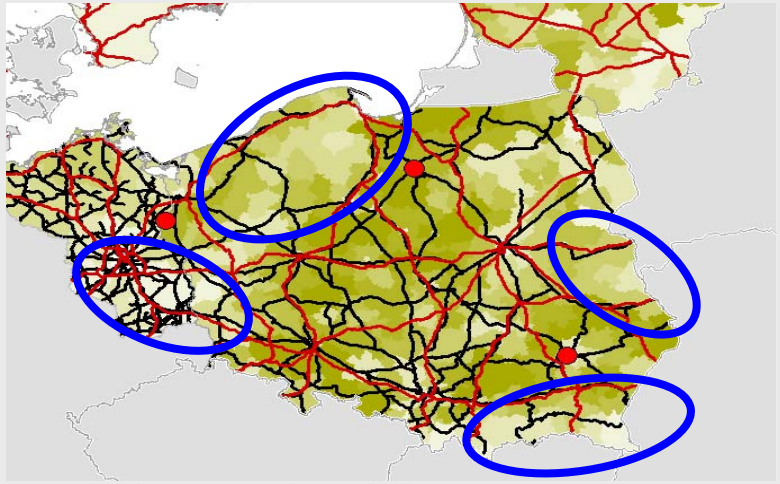


Planning Options – Supply and Logistics Area









Datenherkunft: Brozio und Piorr, 2007

Conclusion and Outlook

Designing and optimizing of supply systems

Advantageous for planning a BtL-plant

Current developments can be taken into account

Support design of decentralized supply structures, especially targeted towards regions with high area potentials, favourable producer structures and good infrastructure

Applicable for all kinds of biomass usage and any location

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