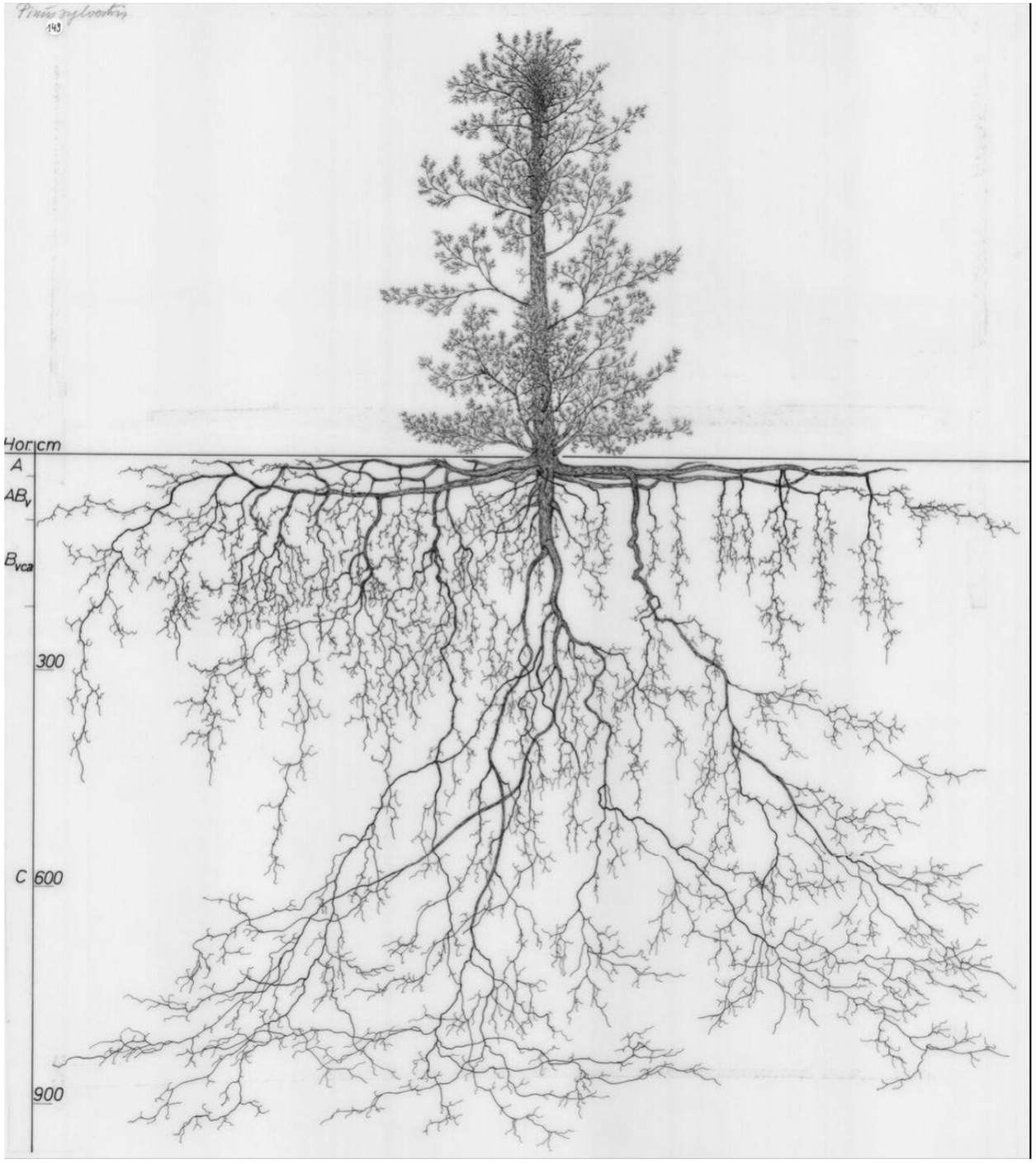
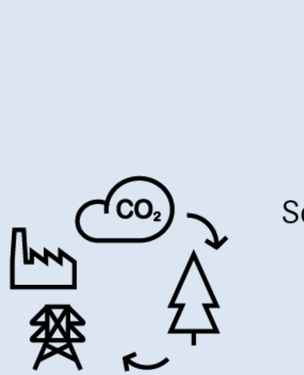

Hor.
cm
A
AB$_v$
B$_{vca}$
300
C
600
900

Transformation of District Heating and Cooling Systems towards high share of renewables

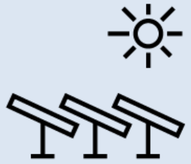
Thomas Pauschinger, Heiko Huther (AGFW, GER)
Alice Dénarié (Politecnico di Milano, IT)
Per-Alex Sörensen (Planenergi, DK)
Michael Salzmann, Ingo Leusbrock (AEE INTEC, AUT)

District heating as energy hub

Renewable heat sources

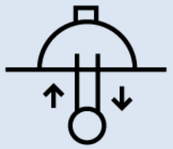


(Biomass) CHP Plant

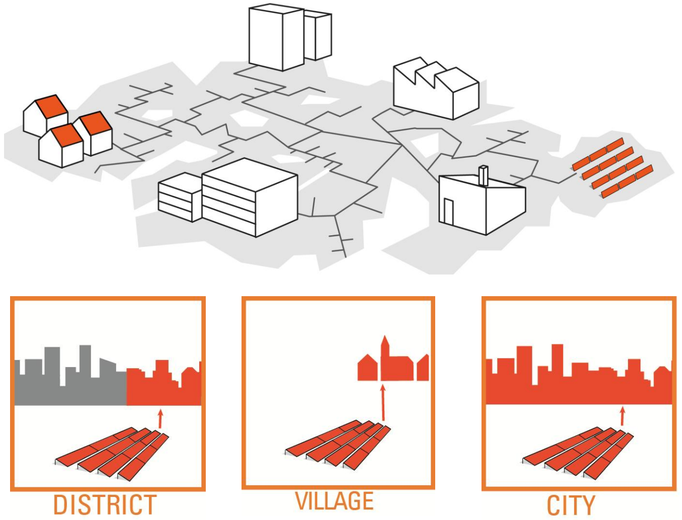


Solar Thermal Heat

Biomass CHP
(decentral)



Deep Geothermal
Heat



District heating as energy hub as part of a larger and integrated energy system

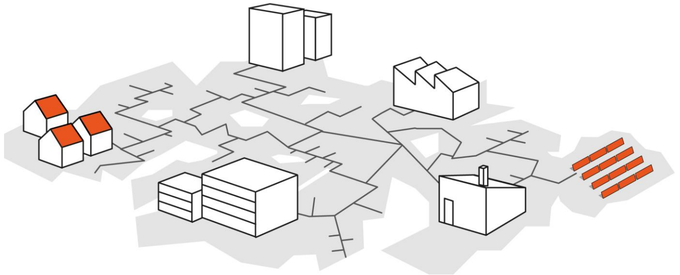
Renewable heat sources

Solar Thermal Heat

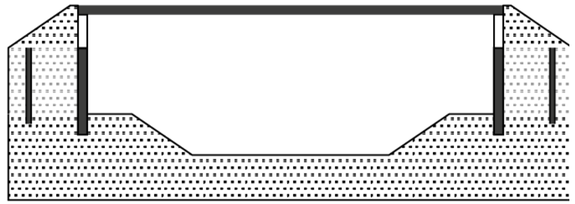
(Biomass) CHP Plant

Biomass CHP (decentral)

Deep Geothermal Heat



Large Thermal Energy Storage



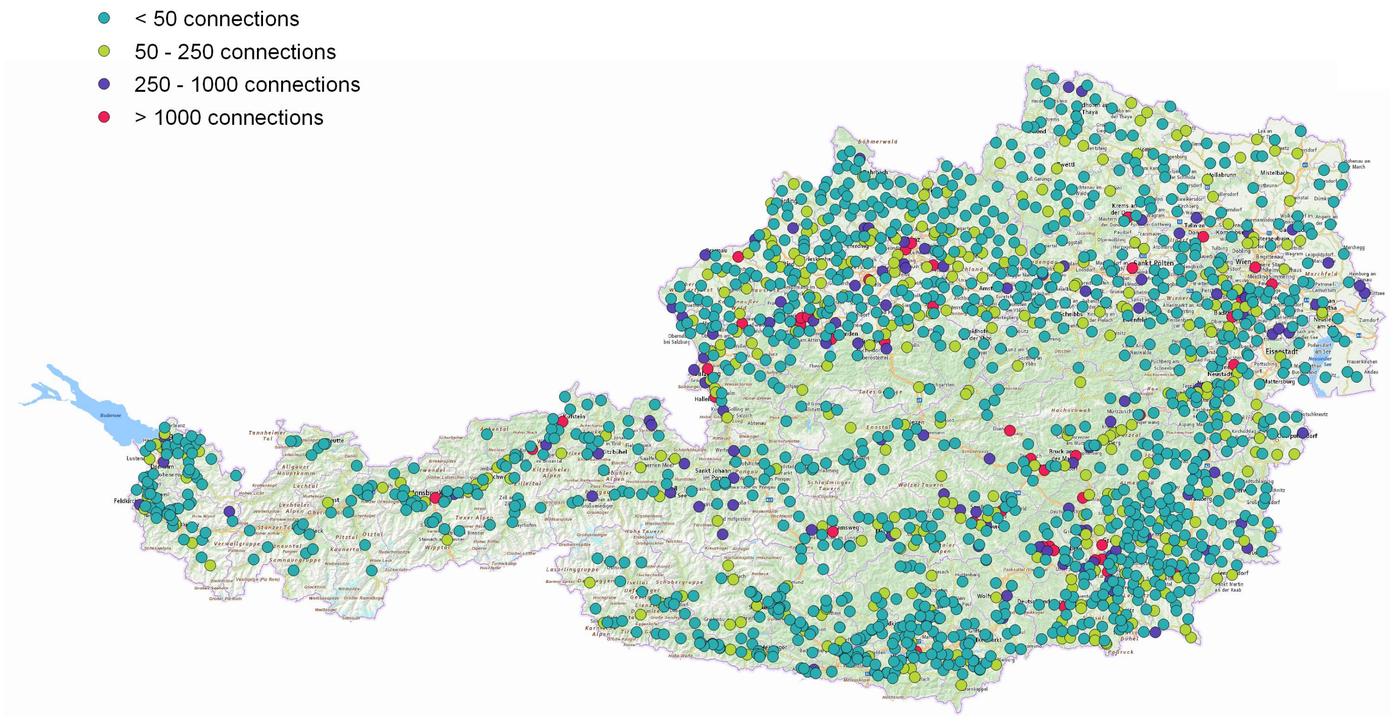
Sector coupling

Industrial Waste Heat

Power2Heat

Large Heat Pumps

Current role of district heating in Austria



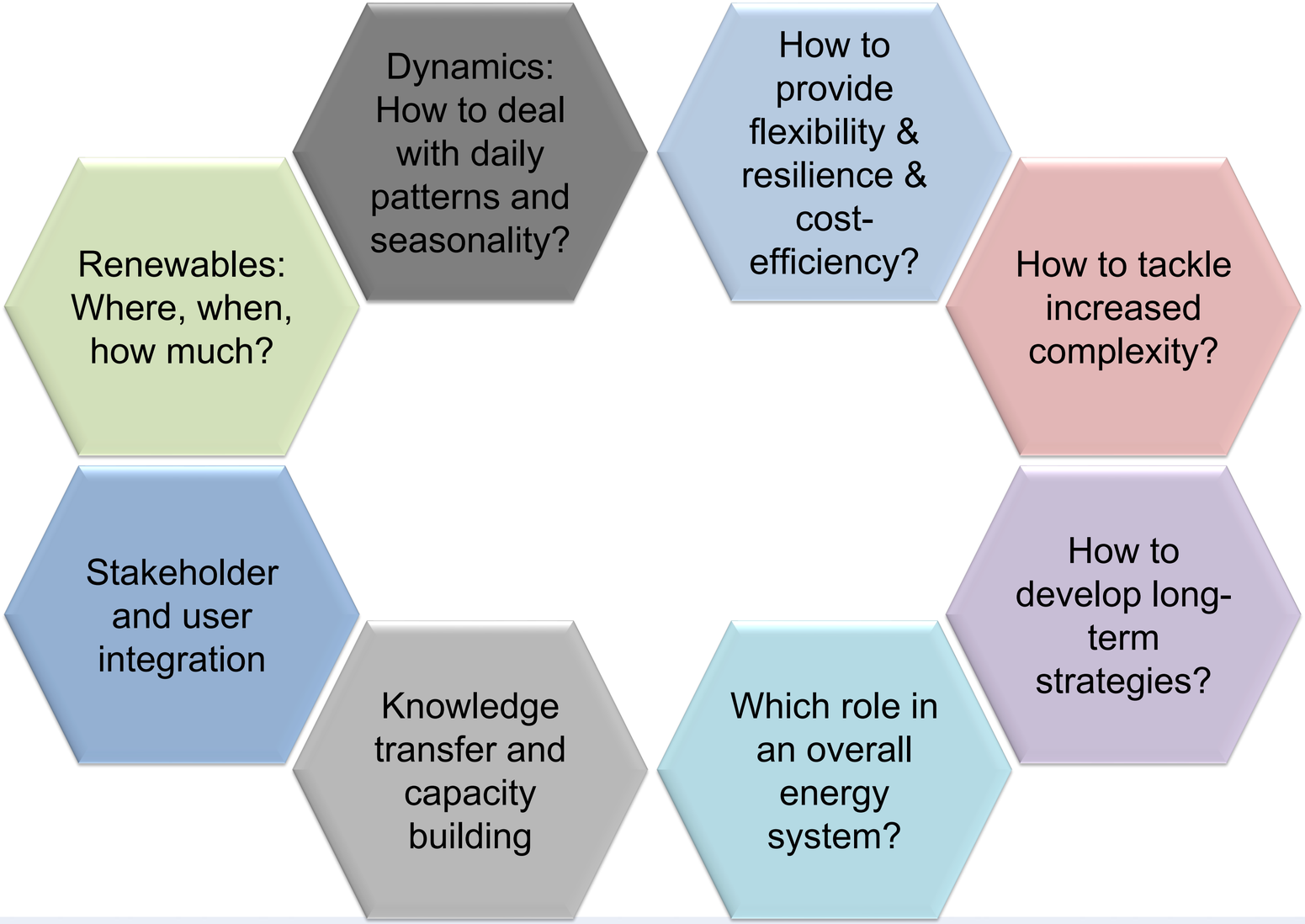
- 20% of total heating demand covered by DH
- ~50% share of renewables in DH
- Many smaller district heating systems → largely biomass-based
- Larger systems mainly fossil → gas CHP

Data sources: http://www.austrian-heatmap.gv.at

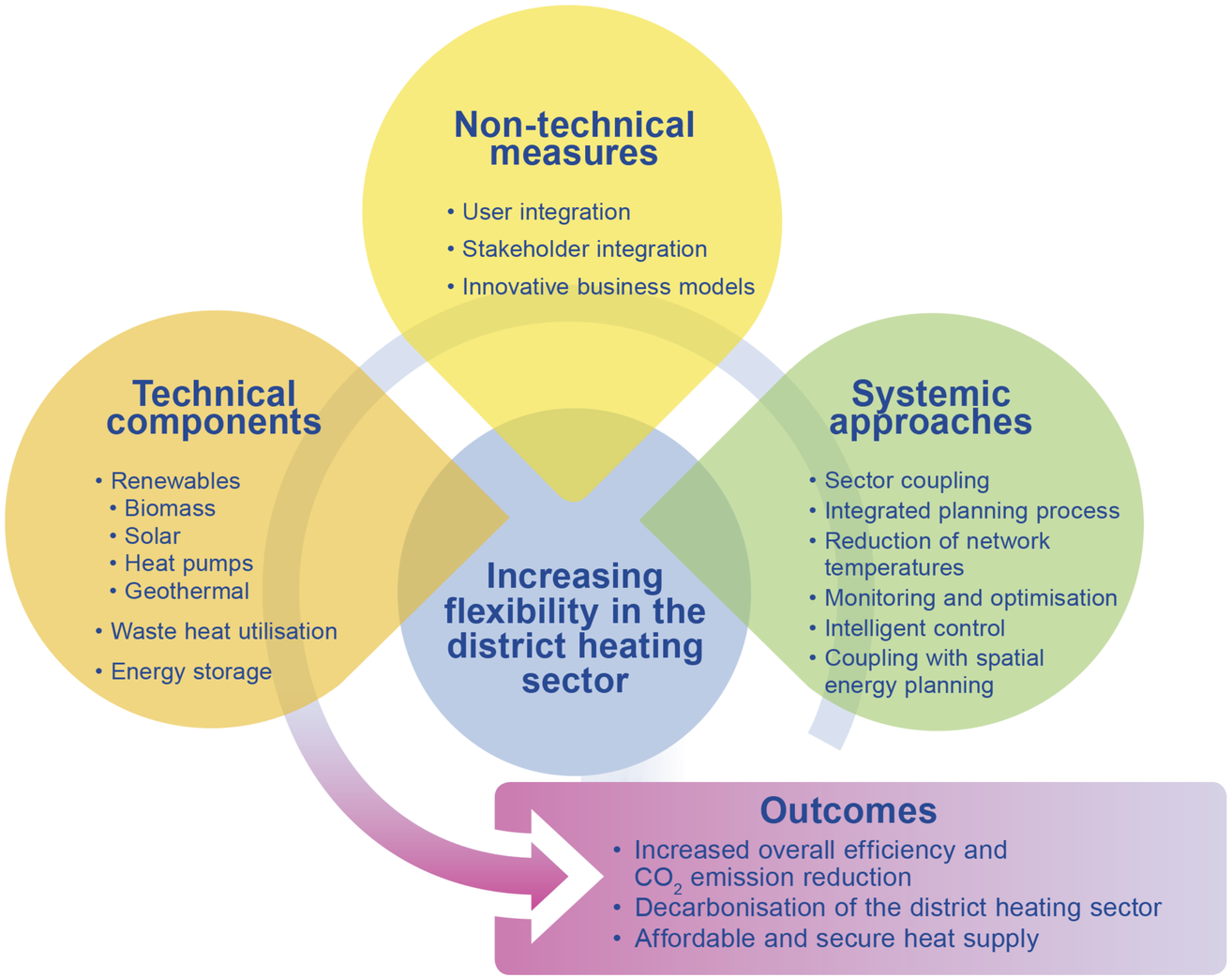
Map data © www.openstreetmap.org

Vision >2030: Harder, Better, Faster, Stronger

Challenges for sustainable district heating as part of a larger energy system?

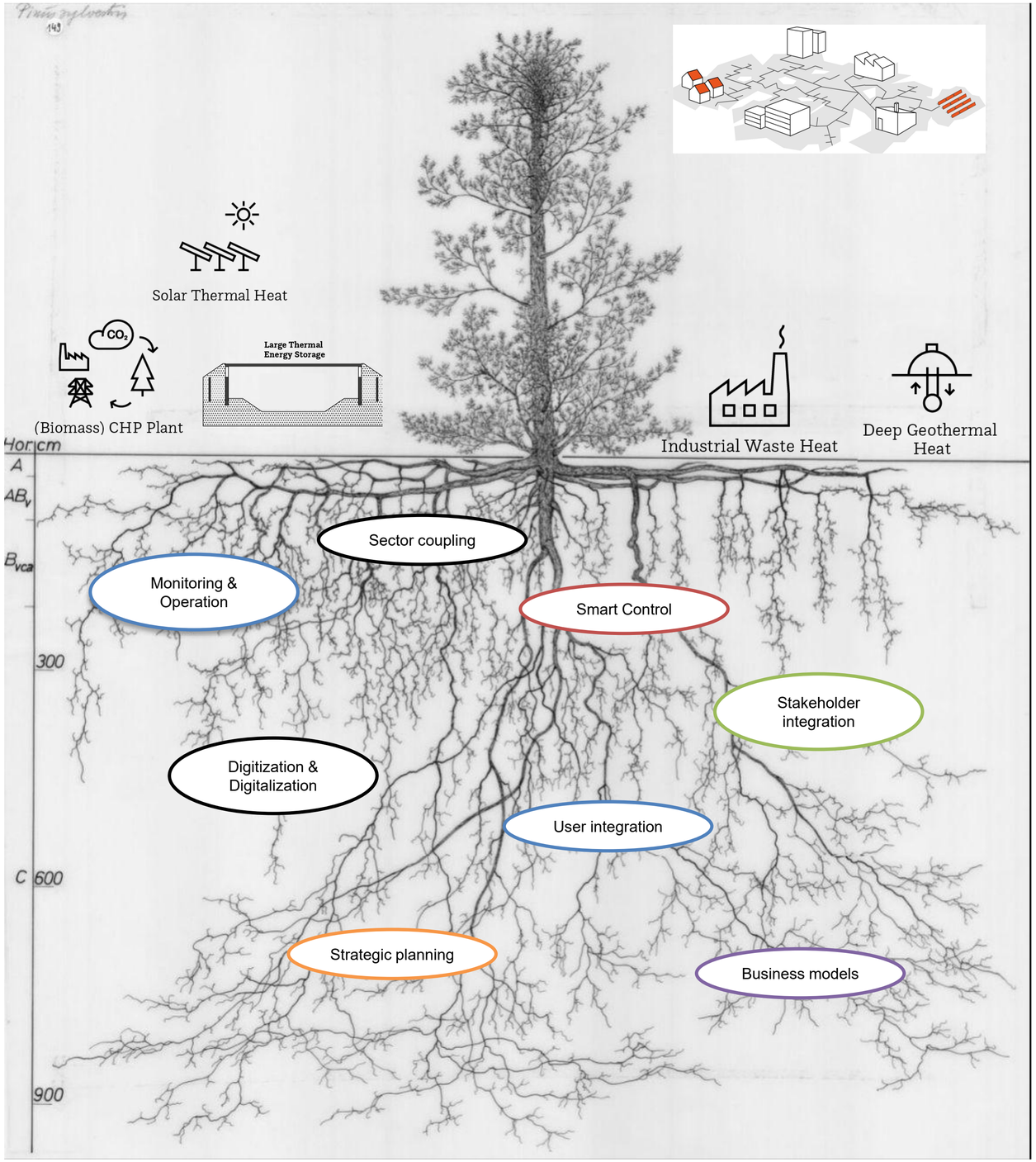


Future district heating: More than just one thing



Regulatory framework

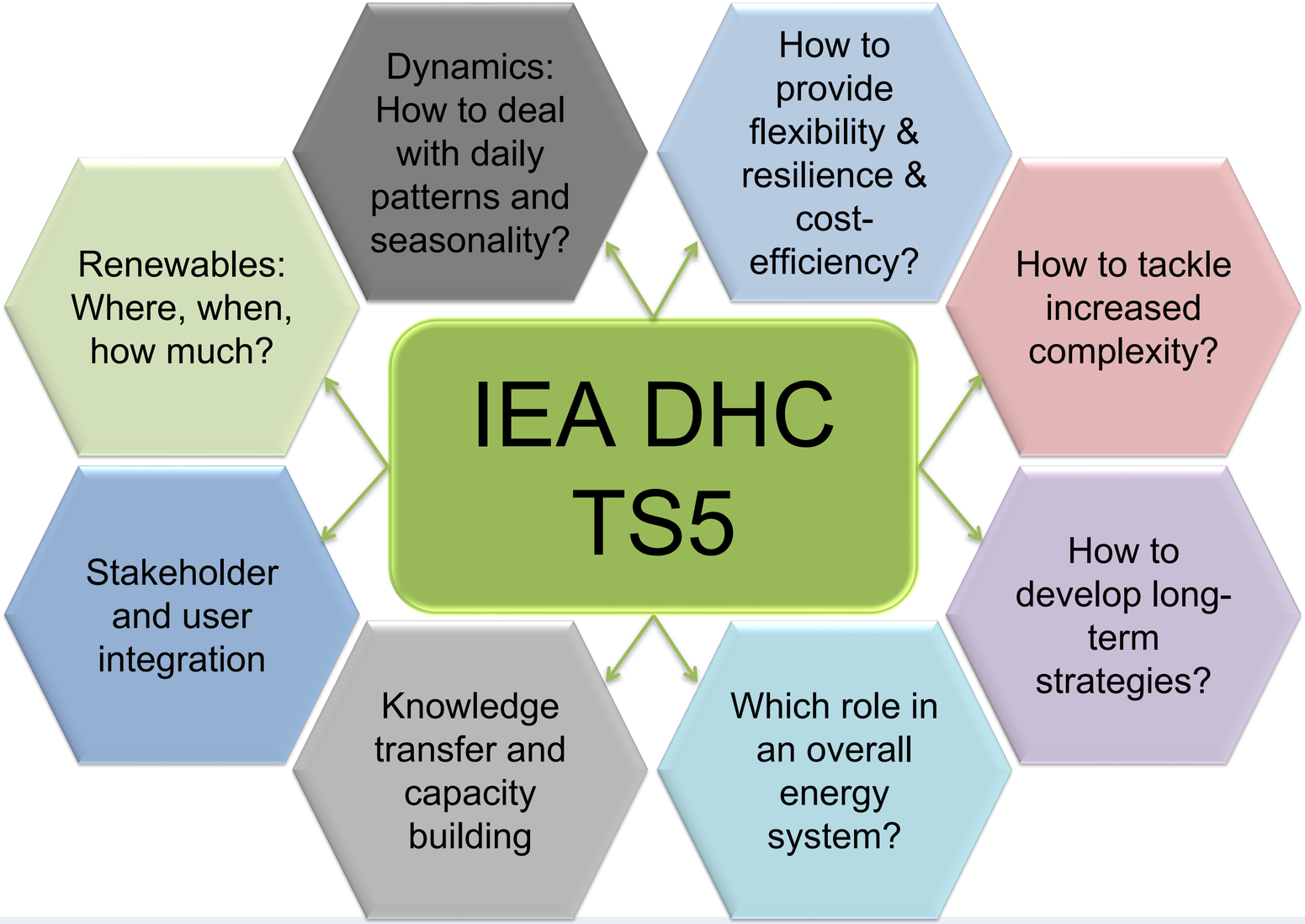
Financial incentives



Long-term security for planning

Level playing field for everyone

IEA DHC TS5: Integration of Renewable Energy Sources into existing District Heating and Cooling Systems



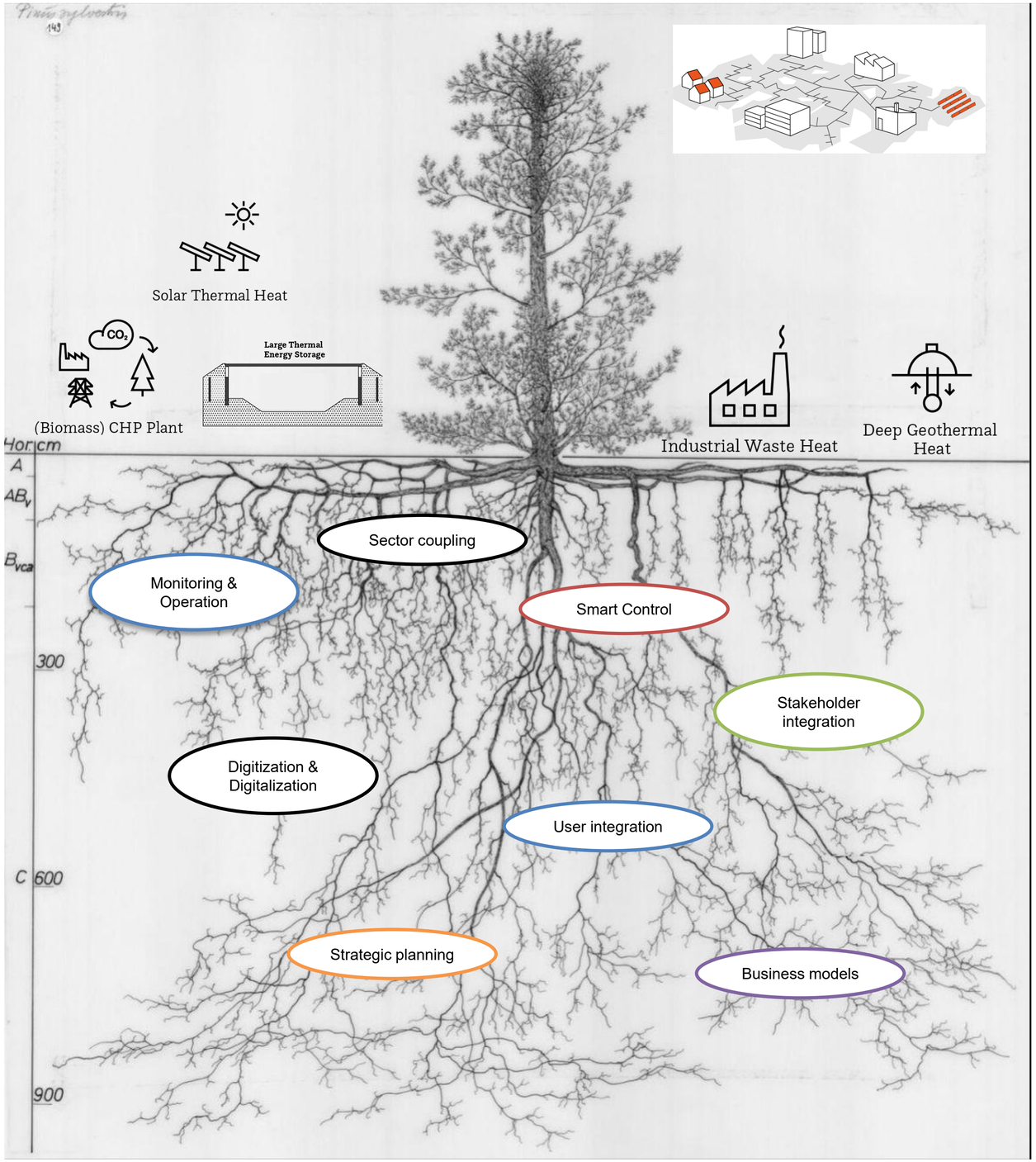
IEA DHC TS5: Integration of Renewable Energy Sources into existing District Heating and Cooling Systems

- Subtasks
  - Subtask A: RES technologies for DHC
  - Subtask B: Transformation of large DHC systems to high shares of RES
  - Subtask C: Decentral integration of RES into DHC systems
  - Subtask D: Non-technical framework: economics, life cycle analyses, legal framework, business models, area availability for RES

- Participating countries
  - GER, DK, IT, AT, SWE, UK, ROC, CN, FIN
- Operating agent
  - Thomas Pauschinger, AGFW, GER (t.Pauschinger@agfw.de)
- Website: https://www.iea-dhc.org/2019-2024-annex-ts5

Regulatory framework

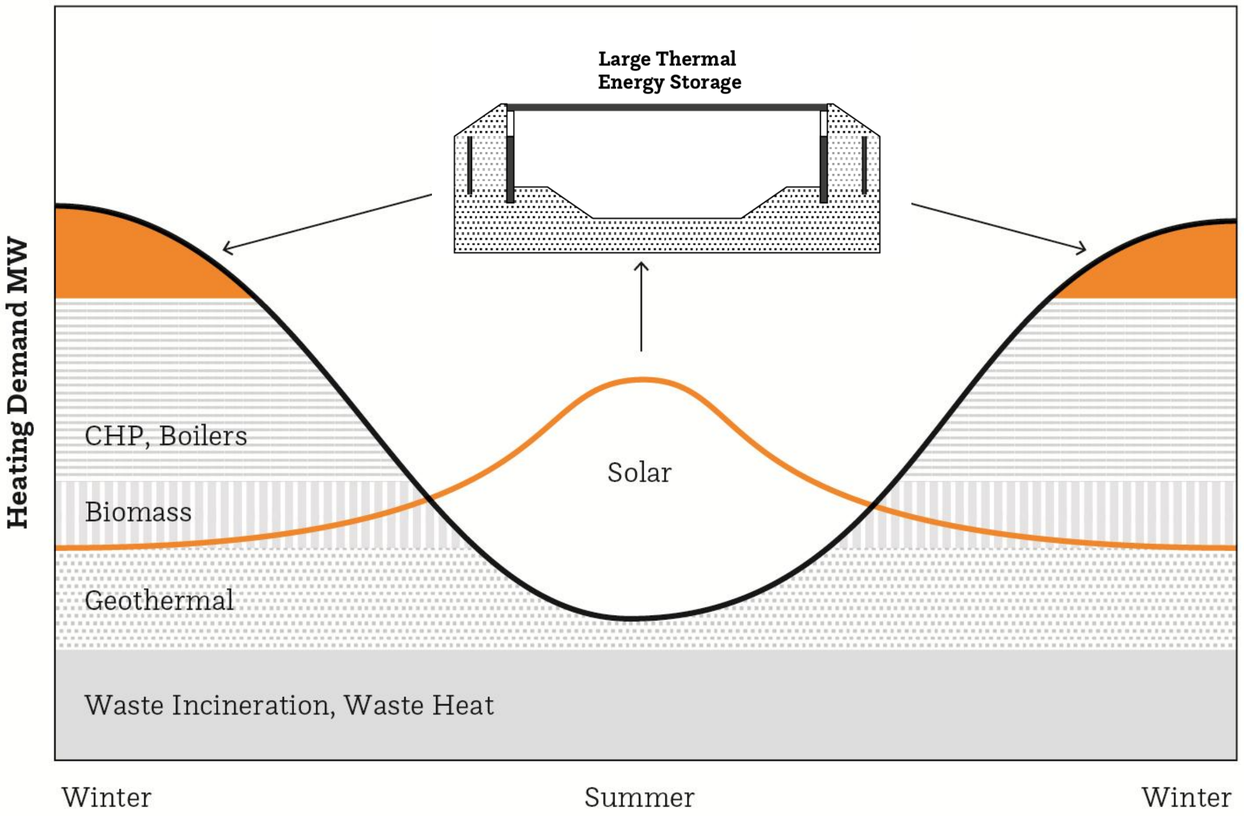
Financial incentives



Long-term security for planning

Level playing field for everyone

Large-scale Storage



- DK storage as frontrunners for Pit Thermal Energy Storage
- First follow – ups in Germany
- Demonstrator to be built in Vienna, AUT

- More R&D and demonstration necessary, also for
  - Cavern storage
  - Aquifer thermal energy storage
  - …

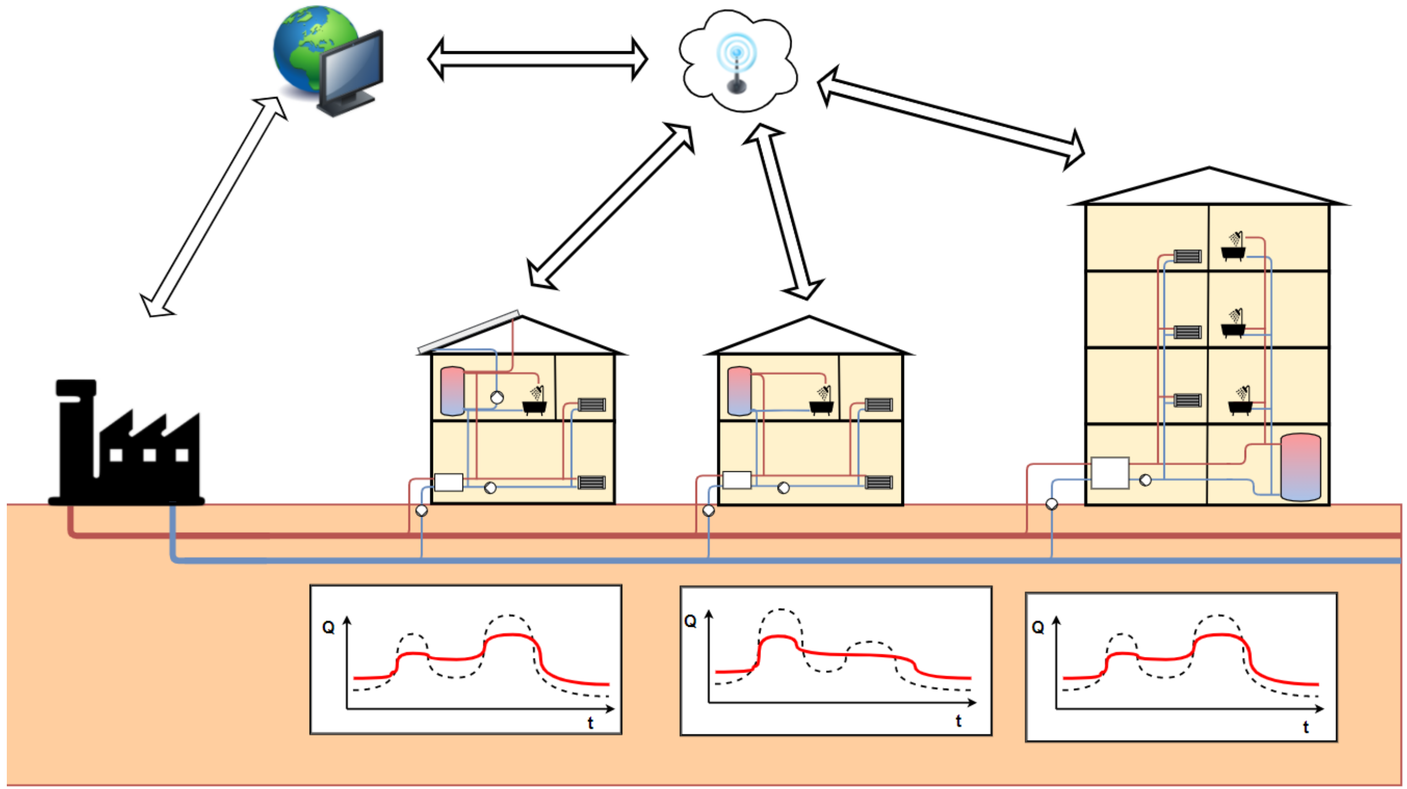
Flexibility by Demand Side Management

Monitoring & Operation

Smart Control

Digitization & Digitalization

Business models



- Requirements
  - „Smart thermal grid ready“ buildings
  - Digitized + digitalized DH system + buildings
  - Sophisticated monitoring & control scheme
  - Suitable business models

https://annex84.iea-ebc.org/

Strategic planning of heat and cold supply

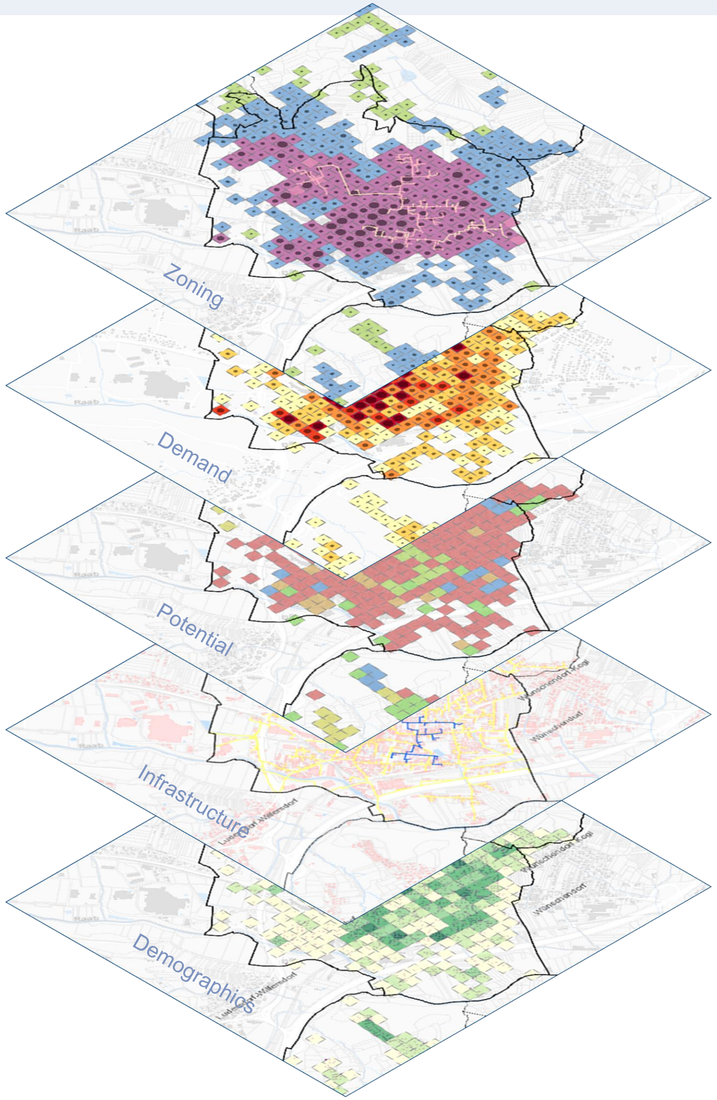
Long-term security for planning

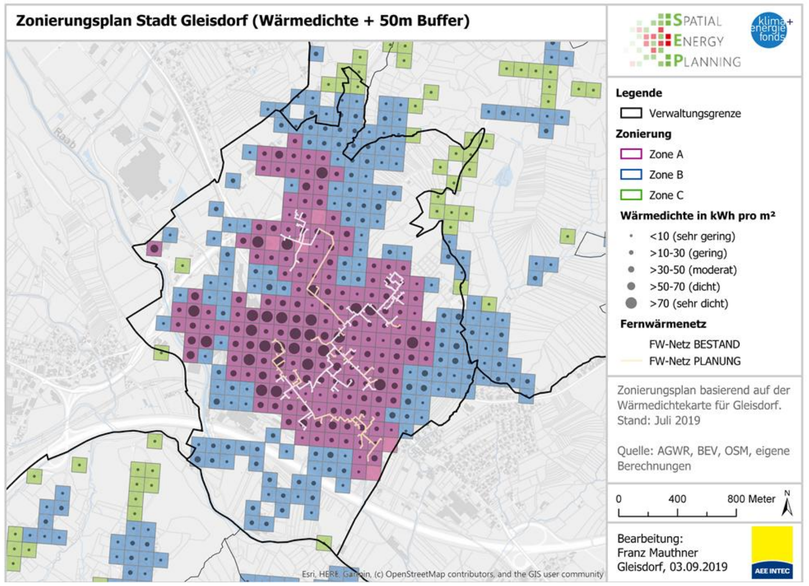
Regulatory framework

Stakeholder integration

User integration

Strategic planning





Integration of WWTPs: Potential & opportunities

Energy in

Sector coupling

COD

Temperature influent
10 – 25 °C

Energy out

Biogas

Temperature effluent
10 – 25 °C
e.g. via heat pump

Heat from
- *Combustion*
- *CHP*

Internal processes
- *Optimization e.g. AD*
- *Aeration & pumping*
- *Buildings*

Resource cycles
- *Nutrient recovery (N,P,K)*
- *High value products (lipids, proteins,…)*

Opportunities
- *Resource, bioeconomy and energy hub*
- *Surface area in surrounding*

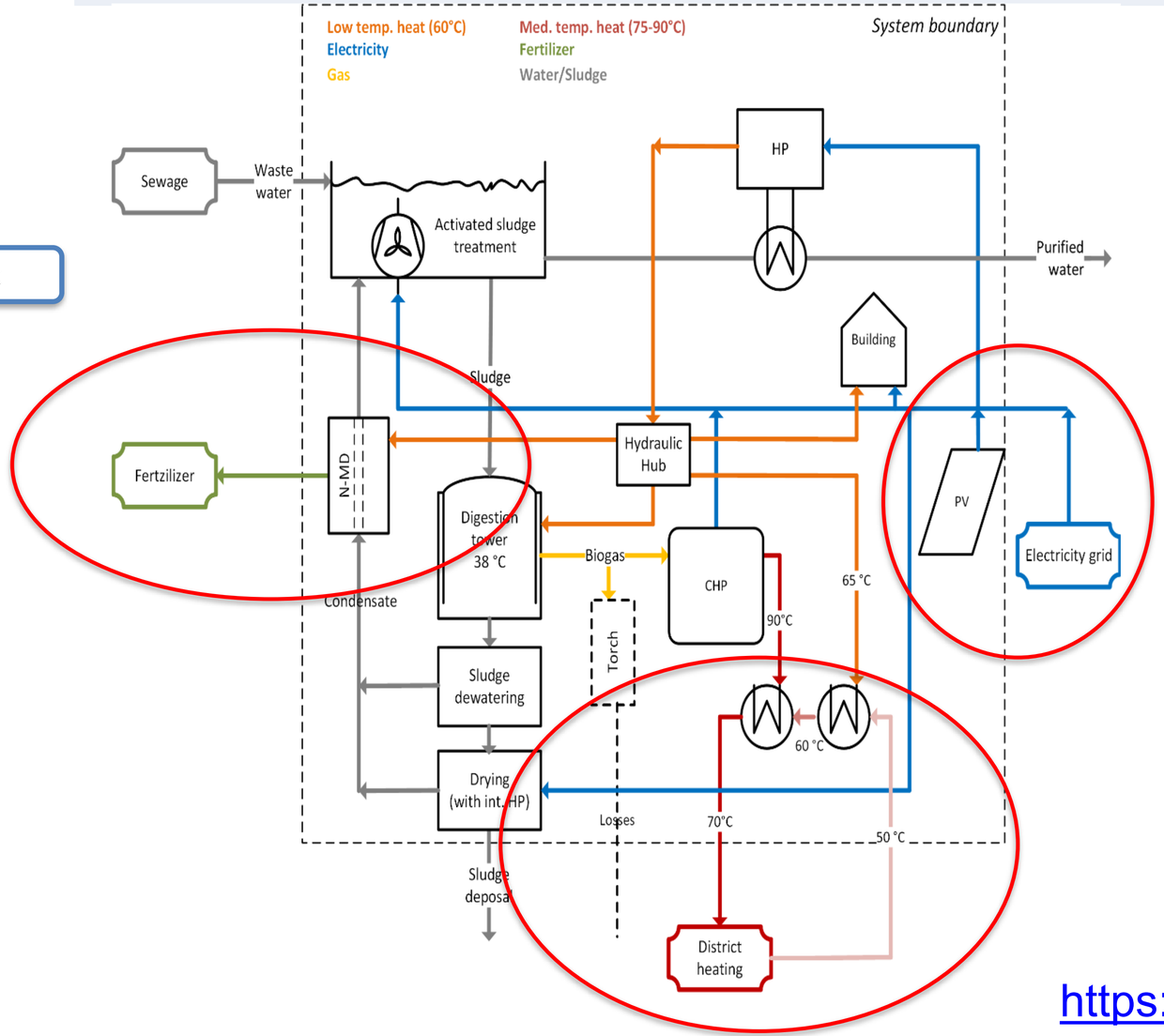
Sector coupling and hybrid network at waste water treatment plant

Regulatory framework

Sector coupling

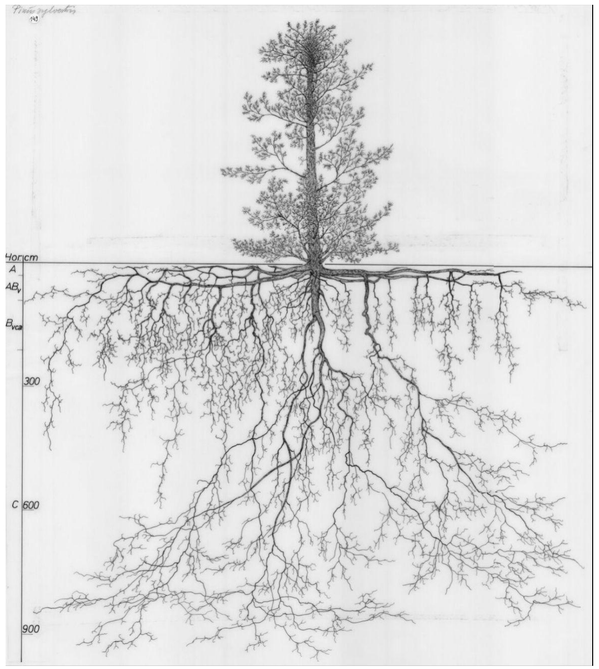
Strategic planning

Business models



- Connection to district heating
- Connection to electricity grid
- Nutrient recovery via Membrane Distillation

https://thermaflex.greenenergylab.at/



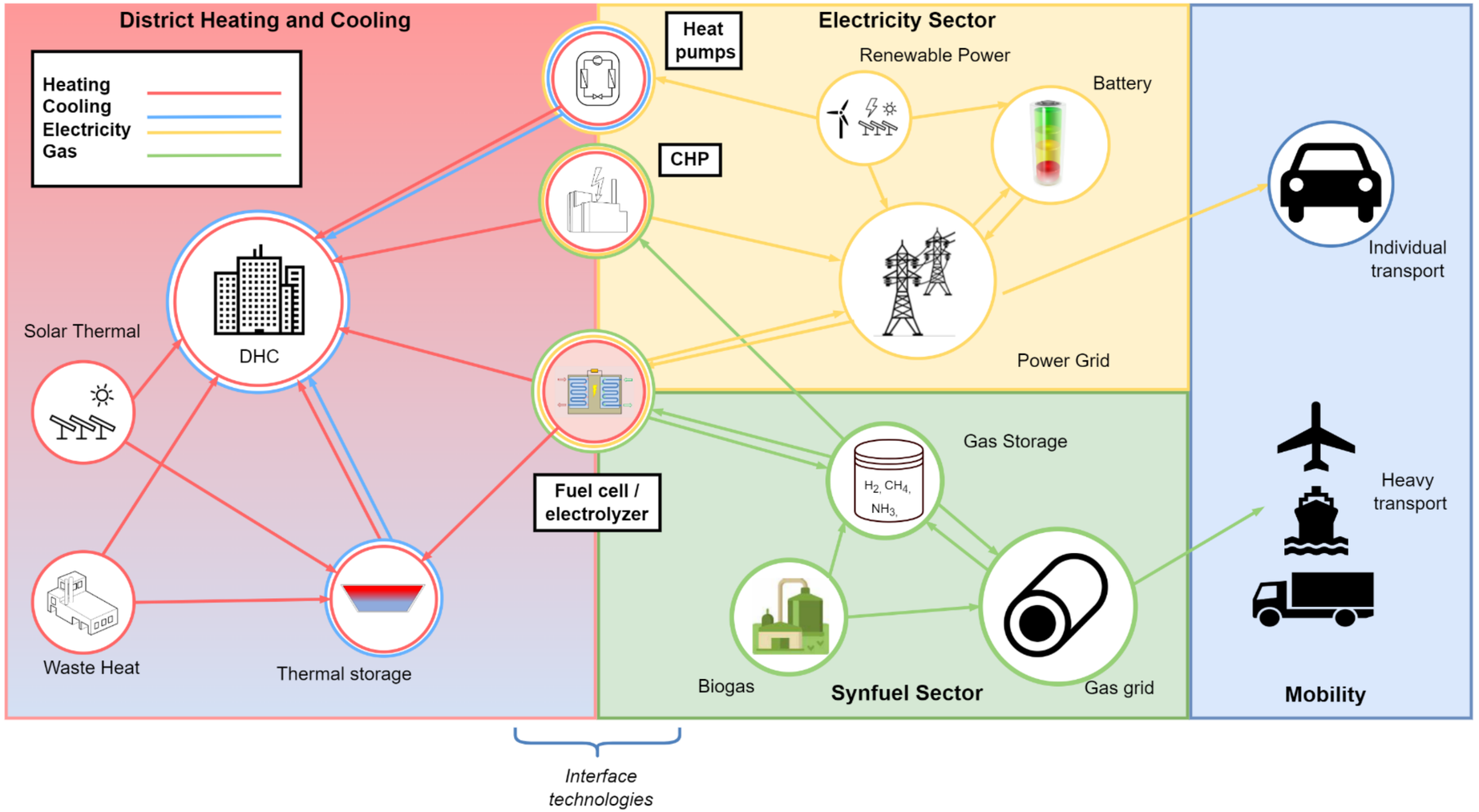
Source: https://www.publicdomainpictures.net/en/view-image.php?image=175863&picture=forest

Sector coupling: towards an integrated enery system

Sector coupling

Strategic planning

Business models



Stakeholder integration

Utilities

City

Some R&D guys…

- Talk early
- Talk with all stakeholders
- Talk often
- Be proactive
- Engage and involve

City council

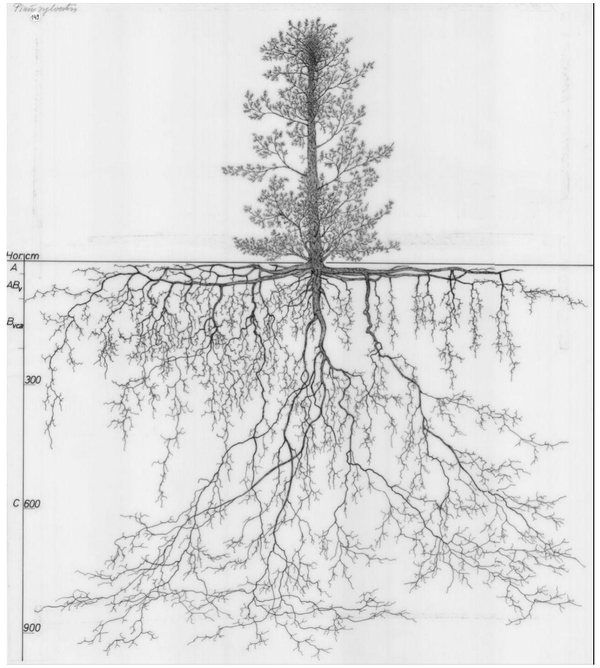
Mayor

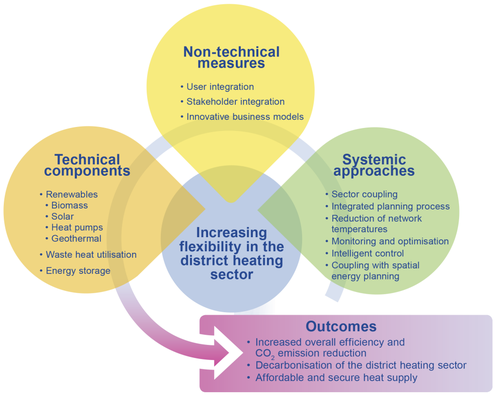
Regional authorities

Planners

Source: https://www.flickr.com/photos/tom-margie/2085155209

Future district heating: More than just one thing





AEE INTEC

IDEA TO ACTION

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