Biogas From Wastewater Sludge Experience in Latvia

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Map of the WWTPs in Latvia

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Wastewater treatment in Latvia

- More than 921 WWTP in the country with capacity more than 30 pe with biological sludge treatment;
- One biggest plant «Daugavgriva» (Riga, 1,050,000pe) treats 49,6% of Latvian wastewater, and 40,6% of sludge;
- 21 WWTP with 8,000 – 100,000 pe treats 32,6% of wastewater and 41,3% of sludge

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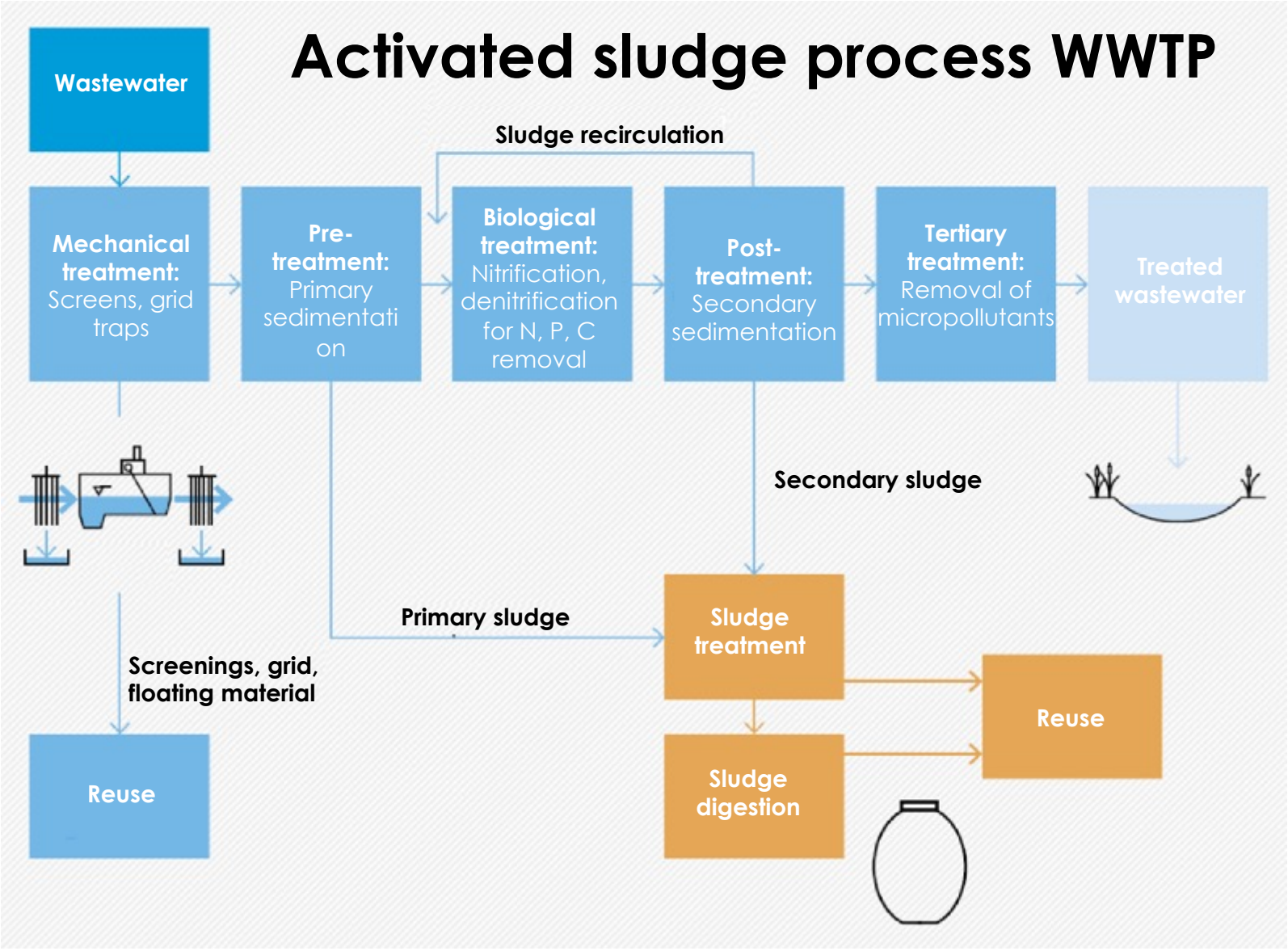
Activated sludge process WWTP



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Wastewater sludge in Latvia

- **Generation:** Production at biologically activated sludge wastewater treatment plants

- **Amounts:** Annual wet sludge amount in Latvia - 2 252 929,62 t WS/year

- **Sludge treatment:**
- Thickening
- Mechanical dewatering up to 25% DS (usually 14-17%)
- Storage with atmospheric freezing, composting, digestion

- **Disposal:** Agricultural and recultivation use

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Sludge treatment requirements

- Sludge shall not contain excessive amounts of heavy metals
- If used in agriculture, shall be «treated»:
  - Stored in open atmosphere for one year and be frozen if full depth
  - Digested in digestors
  - Digested in compost
  - Treated with lime
  - Can be used only for certain agricultural crops

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Sludge properties

Parameter	Sludge
Organics, % of DS	40-70%
Total nitrogen, % of DS	3-7%
Ammonia as part of total nitrogen, %	<10%
Phosphorus, % of DS	0,9-5,5%
pH	6-7,1
Total nitrogen, g/kg	24-72
Total phosphorus, g/kg	11-30

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Advantages of sludge digestion

- Reduction of the volume about for 50%
- Conditioning o f sludge improving its dewatering properties
- Stabilization of sludge decreasing organics content
- Recovery of nutrients
- Recovery of energy

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Biogas gain potential

- Bovine manure: 20-35m3/t
- Porcine manure: 15-25 m3/t
- Maize (acidified): 185-200m3/t
- Grass (acidified): 120-180m3/t
- Brewery grains: 75 m3/t
- Cheese juices: 50 m3/t
- Vegetable oil: 400-800 m3/t
- Slaughterhouse waste: 600-800 m3/t
- Sludge (10%): 20-40m3/t

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Biogas properties

- **Composition:**
  - Methane: 60-70%
  - Carbon dioxide: 26-36%
  - Other minor gases: nitrogen, hydrogen, hydrogen sulphide
- **Caloric value:** 18-24 MJ/Nm3 (Natural gas – 35 MJ/Nm3)
- Sulphur content before treatment: up to 2,000 ppm
- Sulphur after treatment: 50 to 200 ppm

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Biogas engine properties

- Electric power 35%
- Heating energy 45%
- Electric power: gross 108kW/t, net 98kW/t
- Heat: gross 142kW, net 99kW

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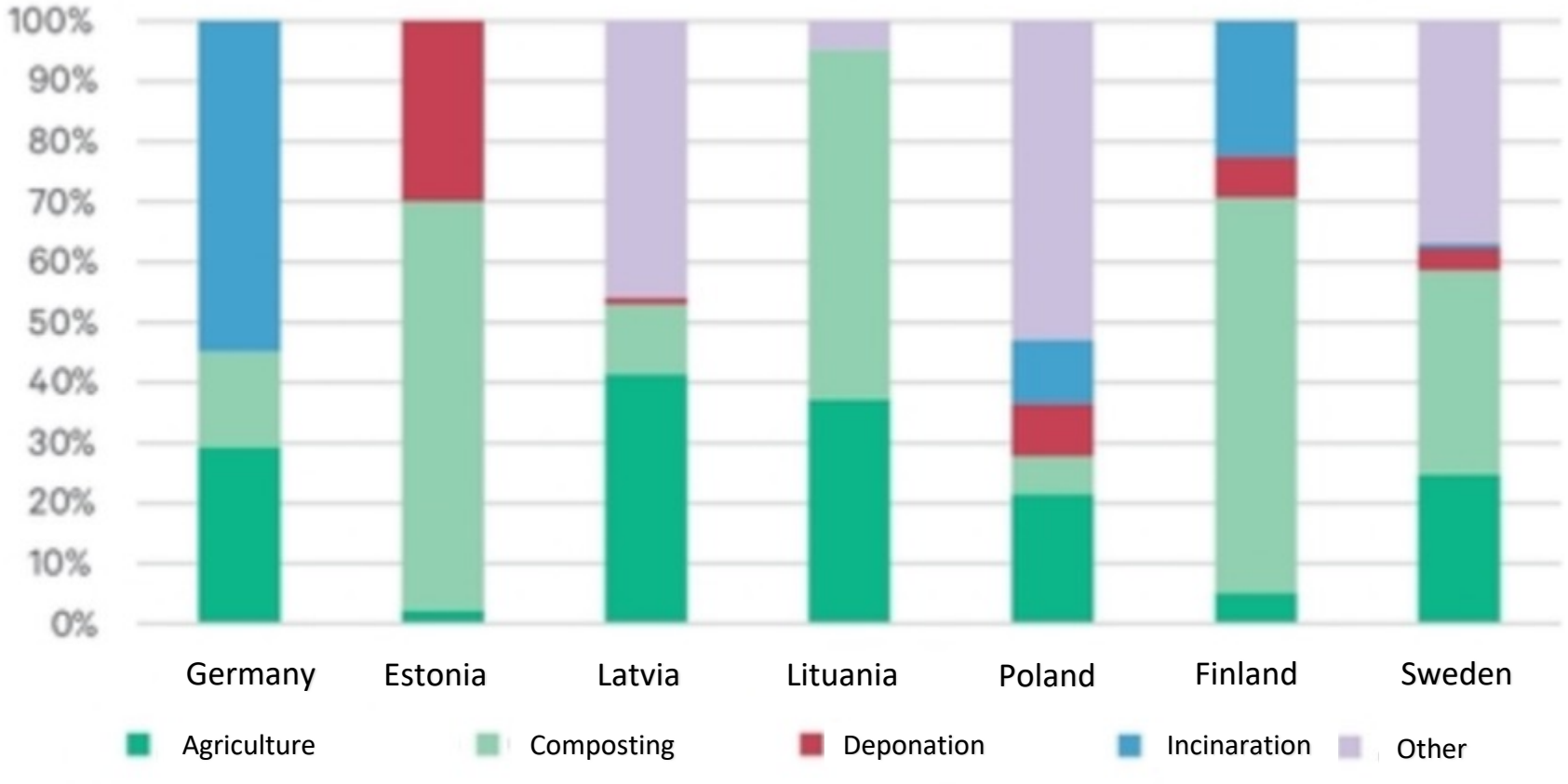
Sludge disposal practices



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River catchment basins of Latvia

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Riga WWTP «Daugavgriva»

- **Operator:** Municipal water company «Rīgas ūdens» SIA
- **Operation:** Since 1991
- **Capacity:** 200,000 m3/d, 1,050,000 pe
- **Wastewater treatment:** Screening, Grid removal, Primary sedimentation, Activated sludge «BioDeniNitro», «BioDeniPho», including N and P removal), Secondary sedimentation, Chemical P removal
- **Sludge treatment:** Thickening, mesophilic digestion (+37C), degassing, dewatering
- **Sludge disposal:** Agriculture and recultivation

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Riga WWTP «Daugavgriva»

- **Raw sludge production:** 914,023 t WS/year
- **Sludge treatment:** Thickening (5-7%), mesophilic digestion (+37C), degassing, dewatering (20%)
- **Sludge production:** 46,838 t WS/year or 96,440 t of DS/year
- **Sludge disposal:** Agriculture and recultivation

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Riga WWTP «Daugavgriva»

- **Digestors:** 3 tanks with 4,650 m3 capacity each, total capacity 13,950 m3
  Biogas treatment: Biological removal of Sulphur
- **Biogas storage:** Gas holder with capacity 2,500m3
  Biogas production: about 4,800,000 m3/year
- **Biogas powerplant:** 2 units, 1 MW each
- **Heat consumption:** Heating digestors and WWTP buildings
- **Electric power consumption:** Used for WWTP operation

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WWTP «Daugavgriva»

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WWTP «Daugavgriva»

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River catchment basins of Latvia

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Biogas station company «Anaerobic Holding» SIA

- **Main investor:** BaltCap Infrastructure Fund (BInF)
- **Agriculture:**
- Farmland: 2000 ha in Iecava, 1100 ha near Daugavpils
- Cultures: Rapeseed, wheat, rye, oats, peas, beans, grass, biomass corn
- **Biogas stations:**
- «Agro Iecava» SIA: «Latvall-Jaunlūči» Iecava, 1.95MW
- «RZS Energo» SIA: «Lāses», Eleja, 0.998MW
- «AD Biogāze stacija» SIA: «Skaista», Daugavpils parish, 1.96MW

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Biogas plant «Latvall-Jaunlūči»

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Biogas plant «Latvall-Jaunlūči»

- «Agro Iecava» SIA
- «Latvall-Jaunlūči», Iecava
- In operation since July of 2011
- Capacity: 1.95 MW
- Biomass resources: Sewage sludge, bird manure, fiber, slurry
- Production of electric power
- Production of heat for Iecava town(5700 inhabitants) heating
- Digested sludge disposal: Agriculture

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Biogas plant «Lāses»

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Biogas plant «Lāses»

- «Anaerobic Holding»- «RZS Energo» SIA
- Eleja, Sesava parish
- In operation since July of 2015
- Capacity: 0.998 MW
- Biomass resources: Sewage sludge, bird manure, fiber, slurry
- Production of electric power
- Production of heat for farm and wood drying plant
- Digested sludge disposal: Agriculture

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Biogas plant «Skaista»

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Biogas plant «Skaista»

- «AD Biogāze stacija» SIA
- Skrudalienas parish, Daugavpils region
- In operation since December of 2011
- Capacity: 1.96 MW
- Biomass resources: Sewage sludge, bird manure, slurry, distilling grains
- Production of electric power
- Production of heat for greenhouse and timber drying
- Digested sludge disposal: Agriculture

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Jelgava WWTP

- **Operator:** Municipal company «Jelgavas ūdens» SIA
- **Operation:** Since 2006
- **Capacity:** 24,200 m3/d, 77,000 pe
- **Wastewater treatment:** Screening, Grid removal, Activated sludge (including N and P removal), Secondary sedimentation
- **Sludge production:** 6,025 t WS/year or 1,015 t DS/year
- **Sludge treatment:** Thickening, dewatering (17%)
- **Sludge disposal:** «Agro Iecava» SIA or «RZS Energo» SIA biogas plants

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Sloka WWTP

- **Operator:** Municipal company «Jūrmalas ūdens» SIA
- **Operation:** Since 2009
- **Capacity:** 9,000 m3/d, 35,700 pe
- **Wastewater treatment:** Screening, Grid removal, Activated sludge (including N and P removal), Secondary sedimentation
- **Sludge production:** 4,700 t WS/year or 650 t DS/year
- **Sludge treatment:** Thickening, dewatering (14%)
- **Sludge disposal:** «Agro Iecava» SIA biogas plant

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Sloka WWTP

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Ogre WWTP

- **Operator:** Municipal company «Ogres namsaimnieks» SIA
- **Operation:** Since 2015
- **Capacity:** 5,520 m3/d, 25,000 pe
- **Wastewater treatment:** Screening, Grid removal, Activated sludge (including N and P removal), Secondary sedimentation
- **Sludge production:** 2,300 t WS/year or 315 t DS/year
- **Sludge treatment:** Thickening, dewatering (14%)
- **Sludge disposal:** «Agro Iecava» SIA biogas plant

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Information sources

- https://www.rigasudens.lv
- https://www.anaerobic.lv
- https://www.baltcap.com
- https://www.jurmalasudens.lv/
- https://ju.lv/
- https://www.ogresnamsaimnieks.lv/
- https://www.meteo.lv/lapas/vide/udens/udens-statistikas-apkopojumi/2-udens-parskati/2-udens-parskati?id=1104&nid=434
- https://www.umweltbundesamt.de/
- https://www.brambis.lv/
- https://www.host.nl/
- Notekūdeņu dūņu apsaimniekošanas stratēģija Latvijā, LUKUA, SIA «Ismade», Rīga, 2021
- E.Štīrs, H.Baumgarts, M.Fišers, «Vides saimniecības darbinieka rokasgrāmata, 3.sējums Kanalizācija», 5.izdevums DWA, 1994
- I.Gemste, A.Vucāns, «Notekūdeņu dūņas», Jelgava, 2007

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Thank you!

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