Interreg North-West Europe Phos4You
European Regional Development Fund

LIÈGE université

RESSOURCEN- UND MATERIALEFFIZIENZ

Valorization strategies for wastewater treatment sludge

28.03.2018, Environment 2018, Cork, Ireland.

Fraikin Laurent & Léonard Angélique, University of Liège

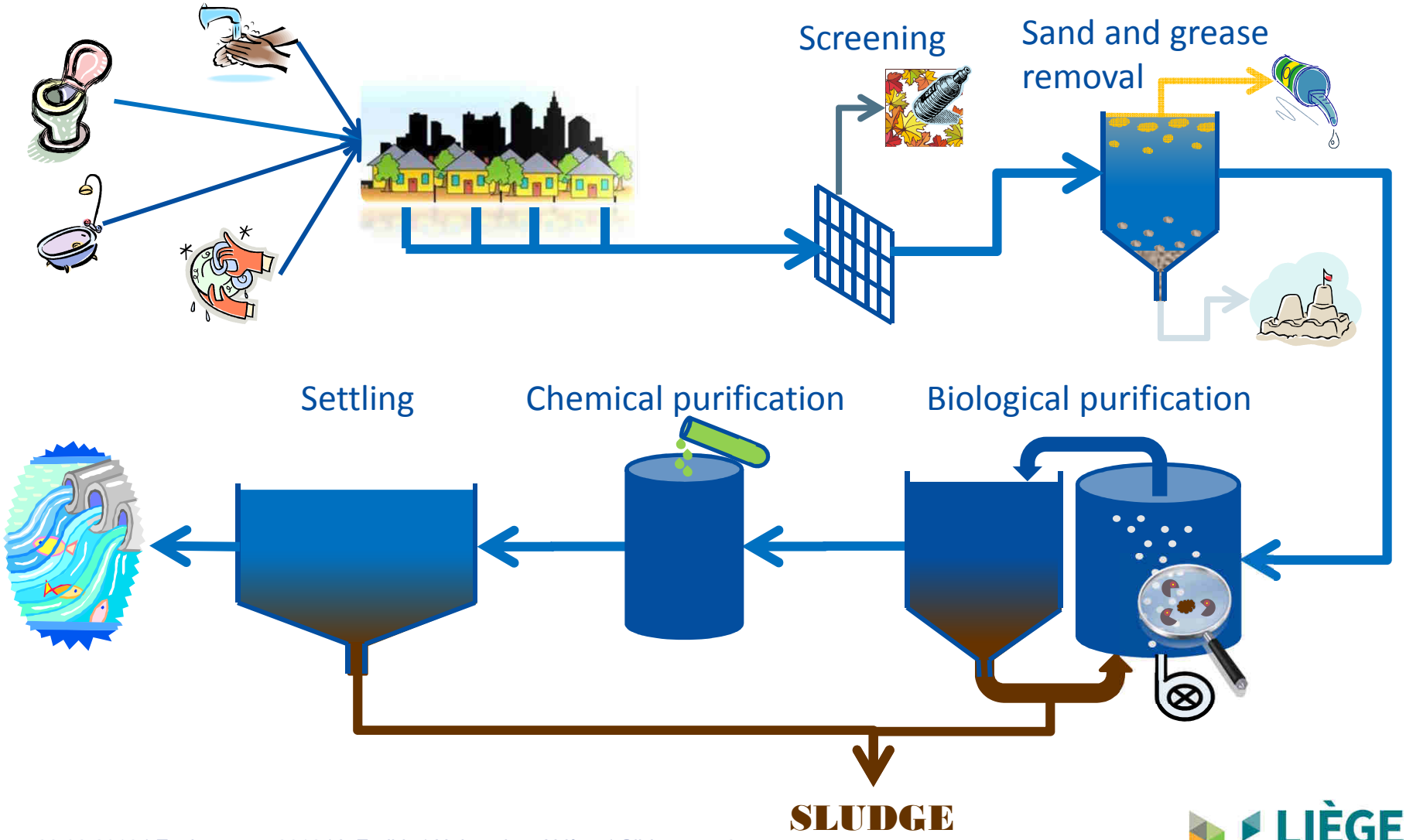
Sludge's origin

Urban residual sludges :

Activated sludge wastewater treatment plant (WWTP)

Oupeye, Belgium – 446500 PE

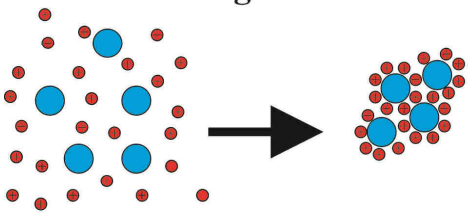
Waste Water Treatment Plant



Sludge processes

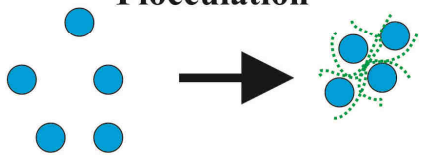
Conditionning

Coagulation



and

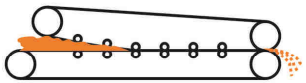
Flocculation



DS ≅ 1% - 4%

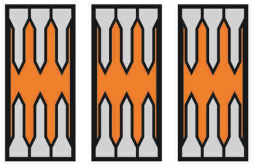
Mechanical Dewatering

Band filter



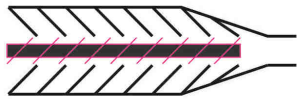
or

Press filter



or

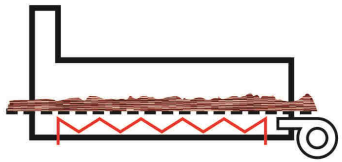
Centrifugation



➔ 15% - 40%

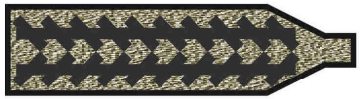
Thermal Drying

Convective dryer



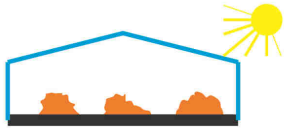
or

Conductive dryer



or

Radiative dryer



➔ 95%

Valorization

Agriculture

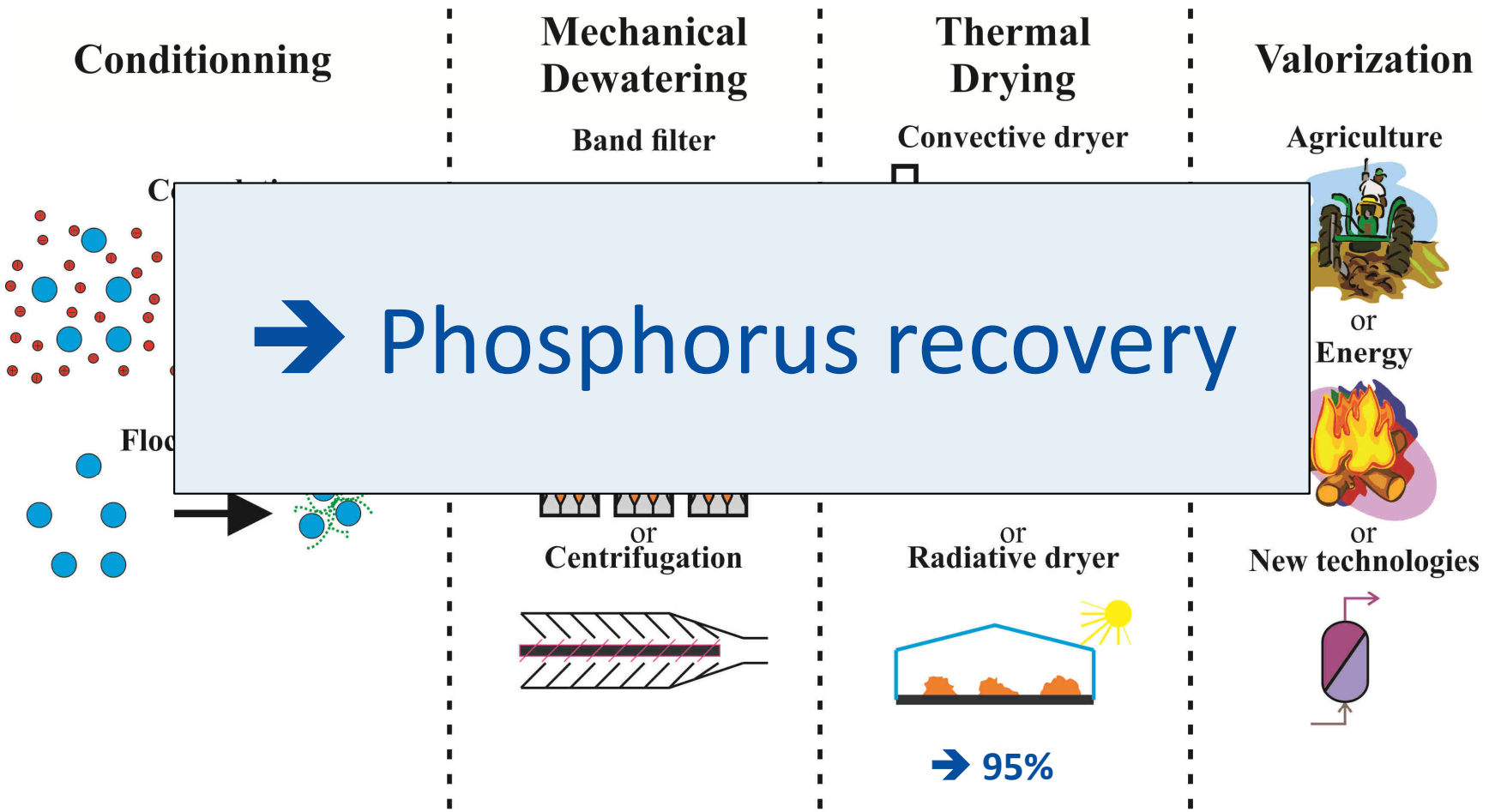
or

Energy

or

New technologies

Sludge processes



➔ Phosphorus recovery

Quantities

Countries	Sludge Production Volume Tds/a	
	2010 estimate	2020 estimate
USA	**7.000.000**	**10.000.000**
Austria	273.000	280.000
UK	1.640.000	1.640.000
Scotland	200.000	200.000
Spain	1.280.000	1.280.000
Sweden	250.000	250.000
France	1.300.000	1.400.000
Germany	2.000.000	2.000.000
Italy	1.500.000	1.500.000
Romania	165.000	520.000
Portugal	420.000	750.000
Poland	520.000	950.000
Hungary	175.000	200.000
EU27	**11.500.000**	**13.500.000**

Europe :

about 50 to 60 million tons of humid sludge

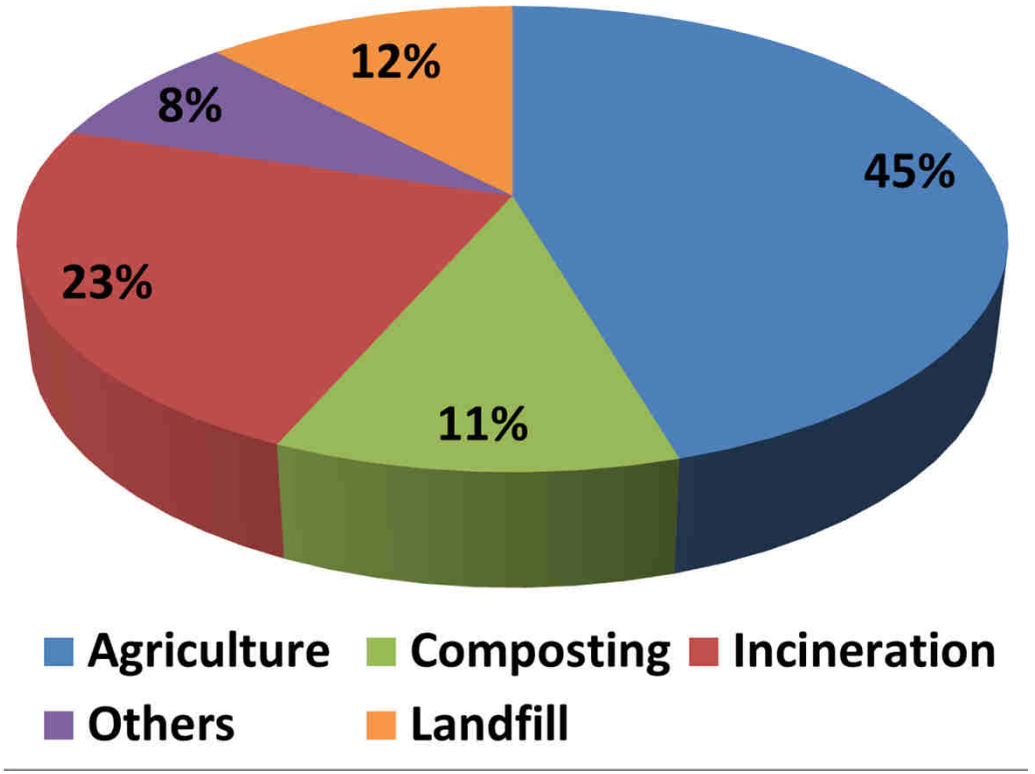
Global production :

More than 50 million tons of dry sludge

Ideal valorization

Lansink ladder + LCA method

- A. Reduce
- B. Reuse
- C. Recycle
- D. Compost
- E. Incinerate with energy recovery
- F. Incinerate
- G. Landfill



Eurostat 2013

Agriculture valorization

- Mineral and organic elements
  - Humic value
  - Fertilizer
- Process
  - Direct: liquid or dewatered sludge spreading
  - After composting
  - After drying
  - After biomethanation (→ + Energy!)

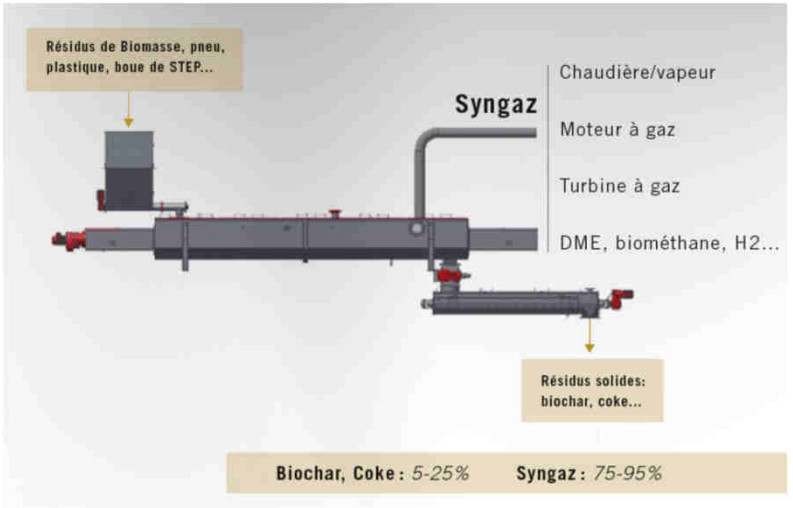
Energy valorization

- Incineration in a specific furnace
- Co-incineration with domestic waste
- Incineration in cement kilns
- Biomethanation
- Pyrolysis/gazification

→ cogeneration

Thermo-conversion

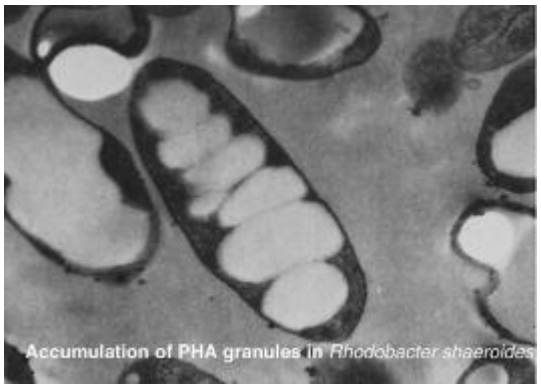
- Pyrolysis or gazification
- Energy + Production of new materials:
  - Syngas (CO, H_2) → organic compounds
  - Adsorbants
- In progress



http://www.biogreen-energy.com/overview/processes/

High value products

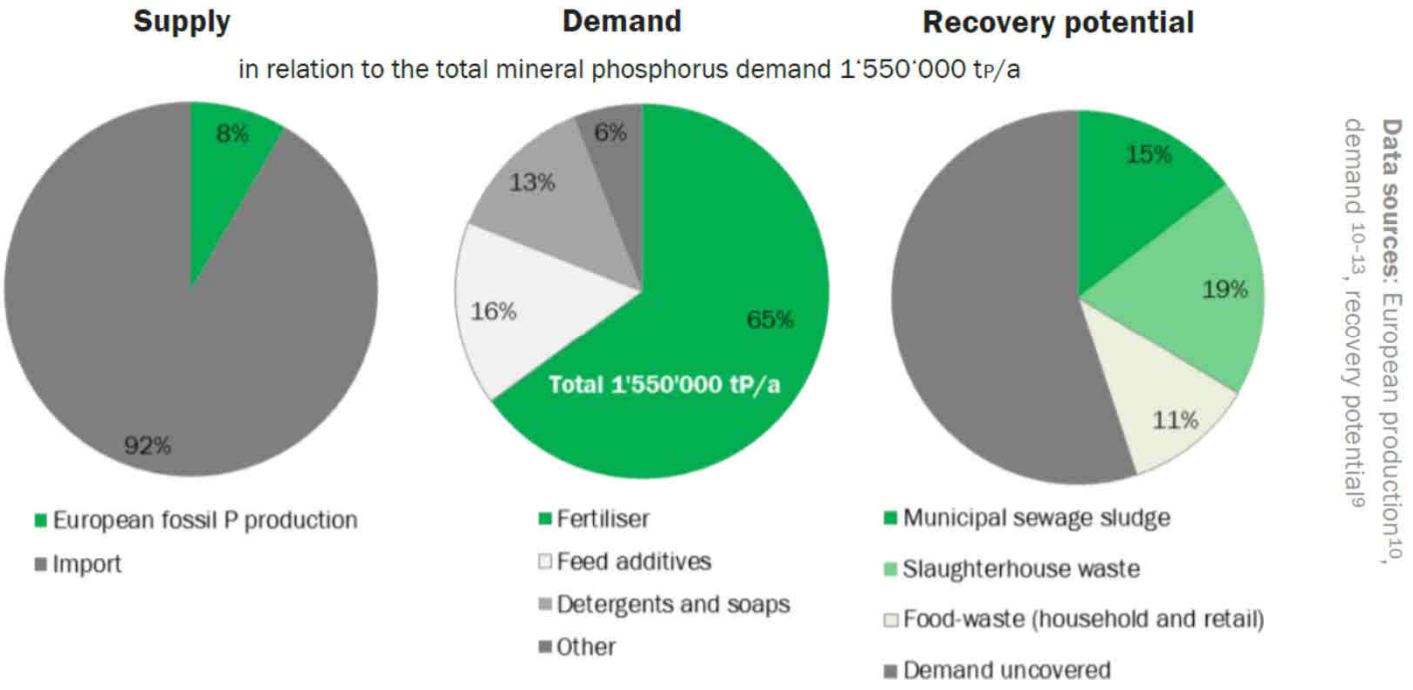
- Sludge = raw material
- Microorganism vs classical process
- Products :
  - Biosorbants
  - Bioplastics
  - Bioflocculant
  - Biopesticide
  - Biofertilizer
  - Enzyme
  - …
- Difficult scaling up
- VEOLIA → bioplastics (PHA) : AnoxKaldnes pilot



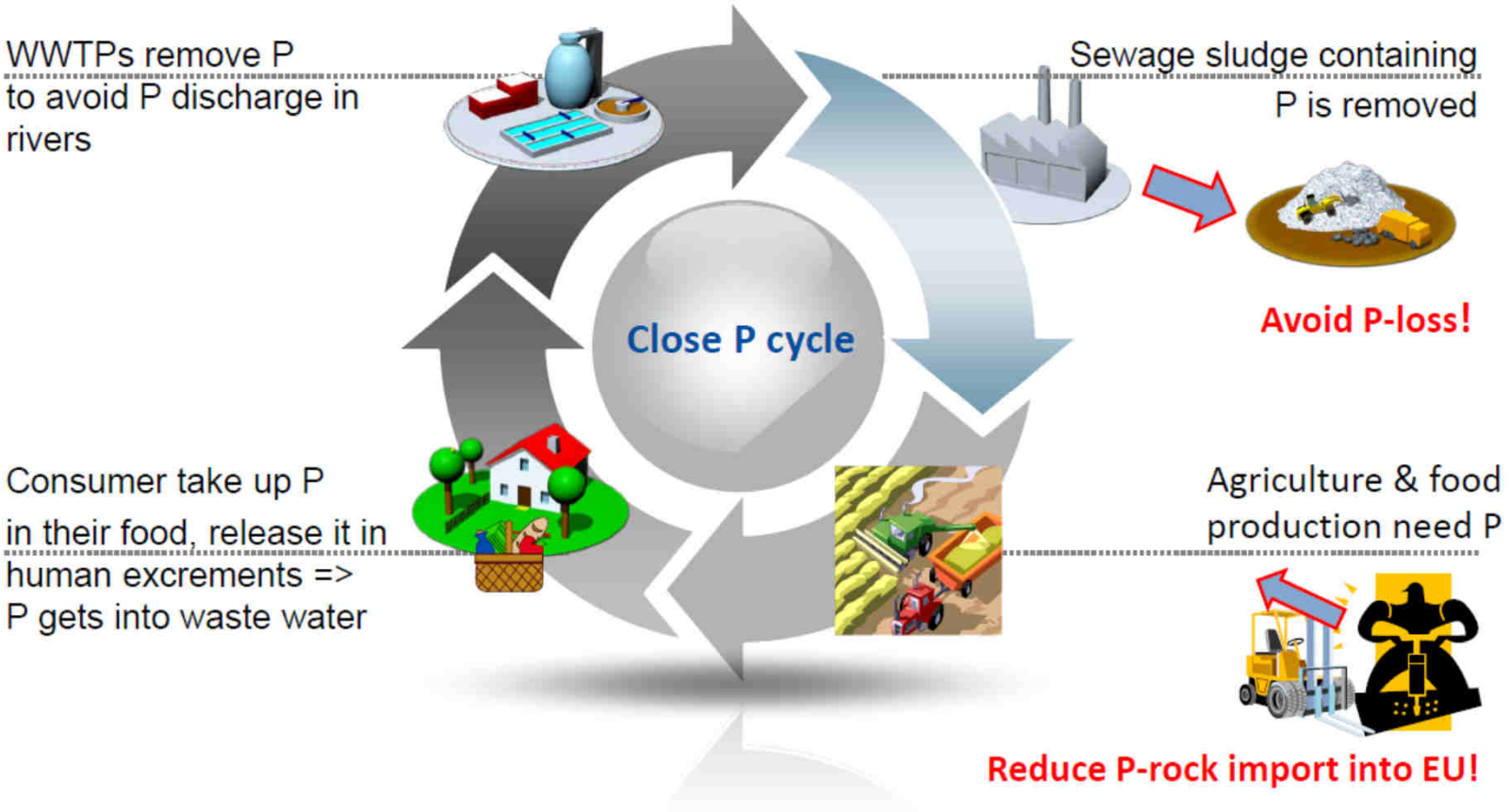
http://www.unil.ch/dbmv/page12541_en.html

Phosphorus recovery

- Critical raw material for the EU: 2014
- Phosphorus is a major element for Life
- 90% of fertilizers ➔ Phosphate rock ➔ resource depletion



Phosphorus recovery



Lippeverband

Phos4You project

- 12 European partners in 7 states

- 6 demonstrators of technologies
  - Thermal treatment of sludge → EuPhoRe → P Slag
  - Ash leaching → TetraPhos → H_3PO_4
  - Sludge leaching → PULSe → CaP
  - Precipitation from liquor → STRUVIA → MAP/DCP
  - µ-Algae biomass
  - Sorbant material for P_2O_5

  } → Innovations for small WWTP

Interreg North-West Europe
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Thank you for your attention!

University of Applied Sciences and Arts Northwestern Switzerland
School of Life Sciences