

Nutrient recovery and recycling in Québec

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Outline of the presentation



Regulatory drivers in QC



Québec City project



Challenges and Decision-Support



Nutrient Stakeholder Platform



Other initiatives: Canada Research Chair

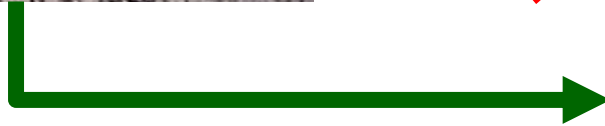


Take-home message



REGULATORY DRIVERS IN QUÉBEC

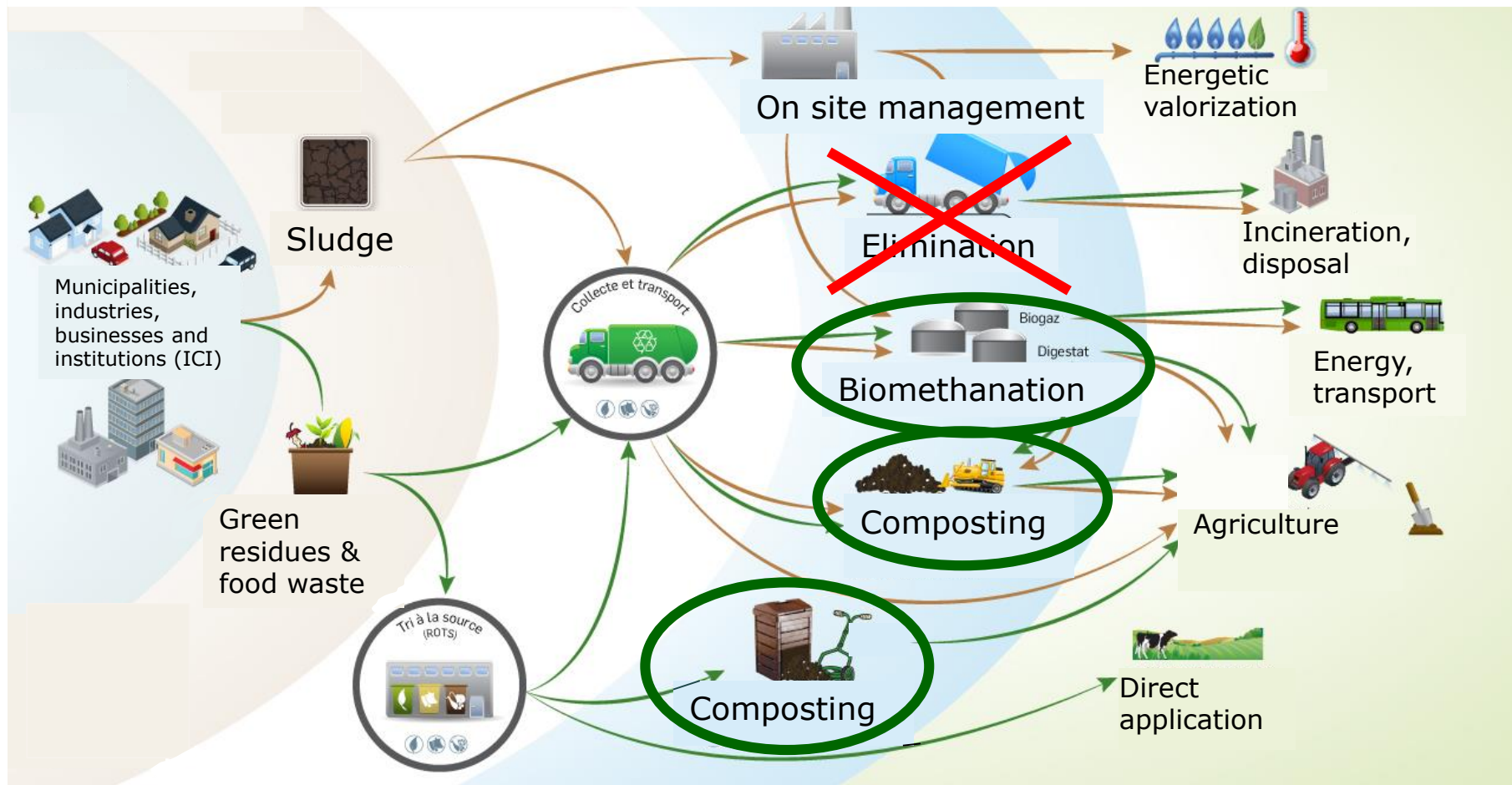
From linear to circular economy ...



VALORIZATION

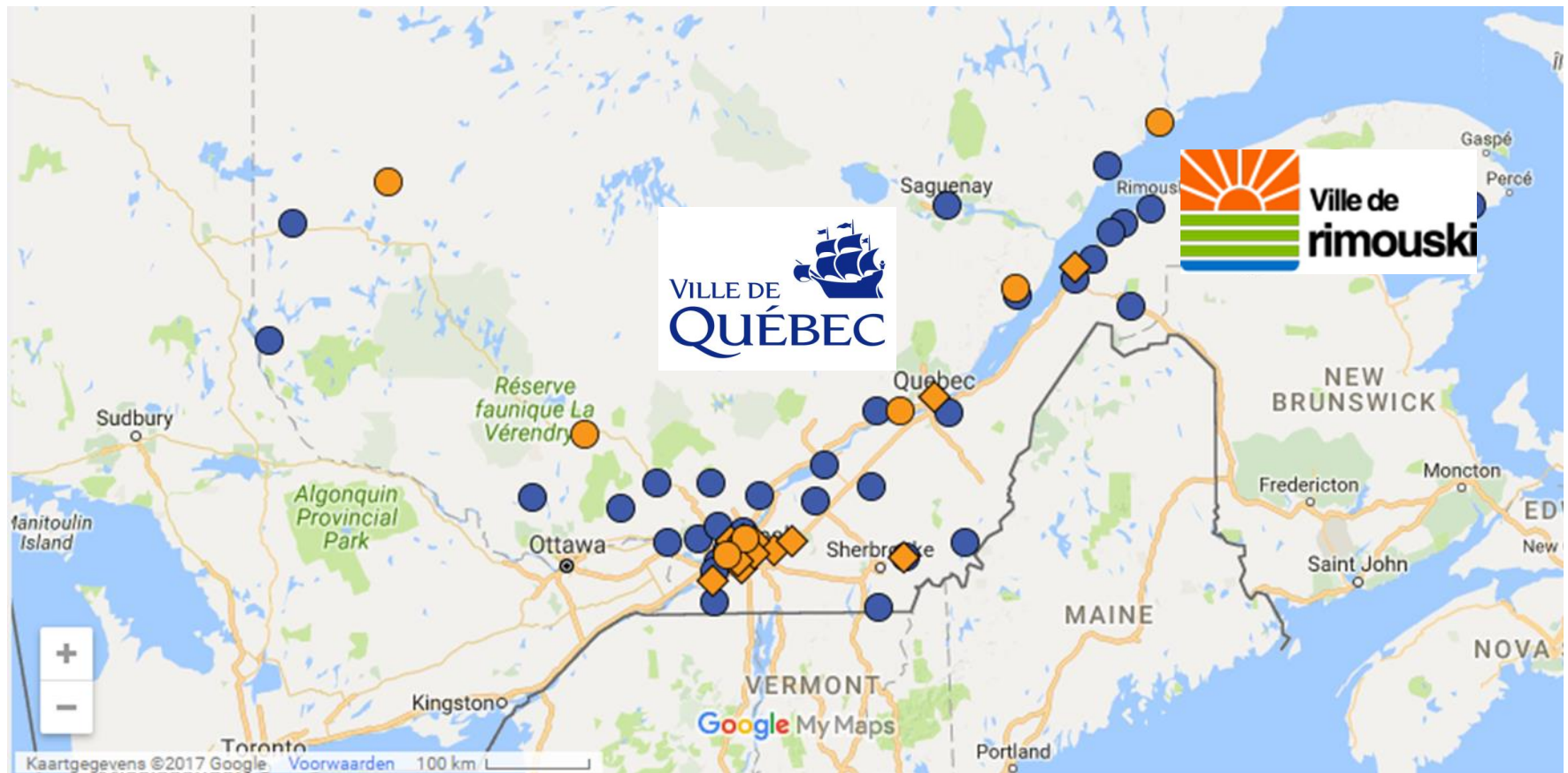
Québec policy on organic waste management:
ban on organic waste incineration and disposal by 2022

Processes for organic waste management in Québec



Adapted from RECYC-QUÉBEC (2012)

Important increase of organic waste valorization plants in Québec



● Composting site - operational

● Composting site - in development

◆ Biomethanation site - operational

◆ Biomethanation site - in development

Adapted from RECYC-QUÉBEC (2015)

Concrete example: Québec City project

- Capacity: \pm 180 000 tons of waste per year
- Production of biomethane: 6.6 million m³/year



- Production of digestates:
 \pm 83 000 tons/year

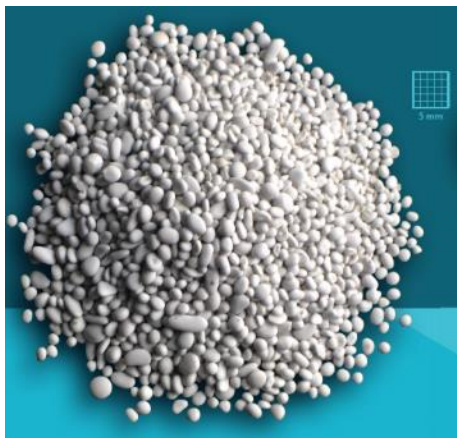


→ **GHG reduction: 9 500 tons CO₂ eq./year**

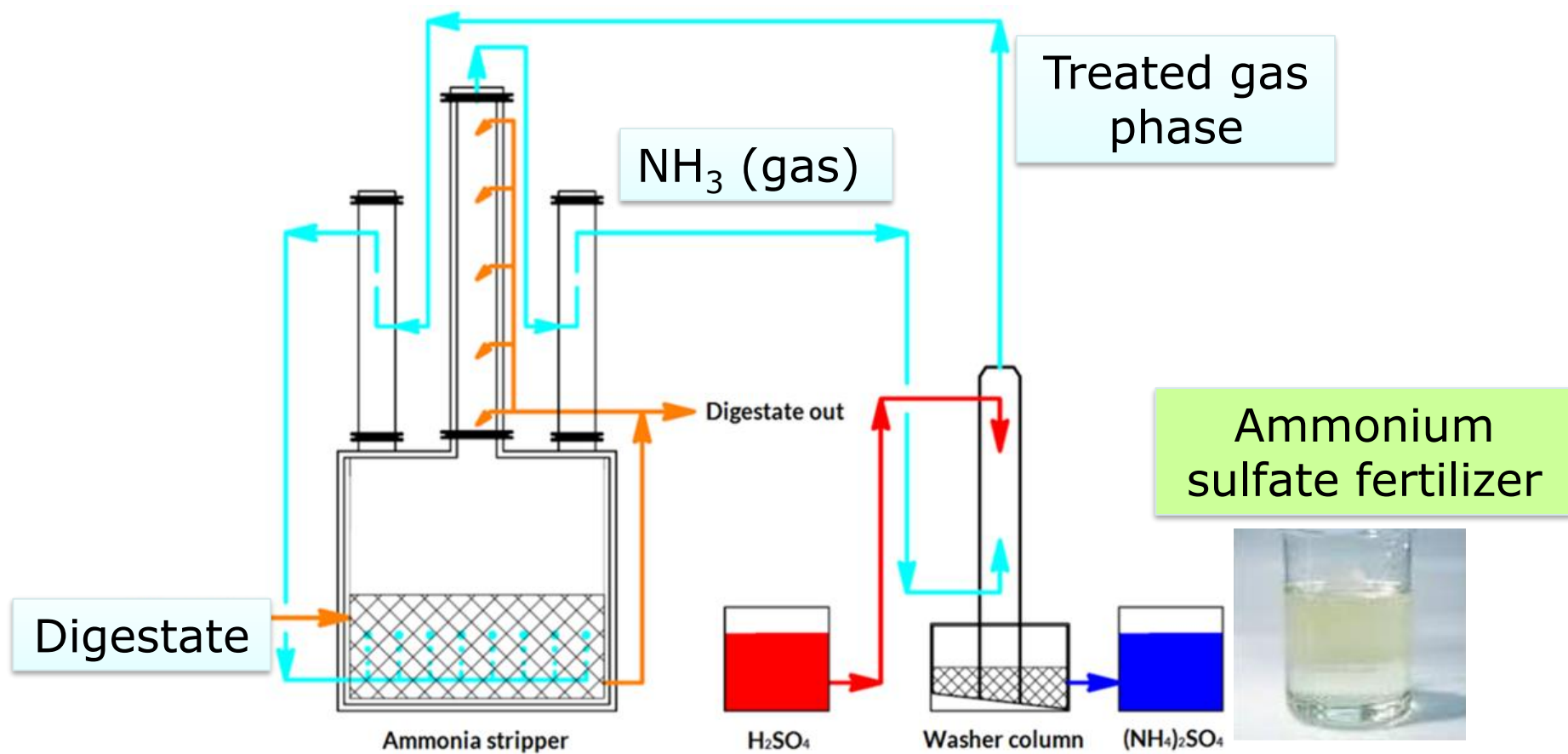


Valorization of digestates?

Transformation into renewable fertilizers and other bioproducts



Concrete example: Québec City project



Source: adapted from Colsen (2015)



CHALLENGES

Multiple research questions arise:



Location?



End-product distribution?



Choice of the technologies?



Economic optimization?

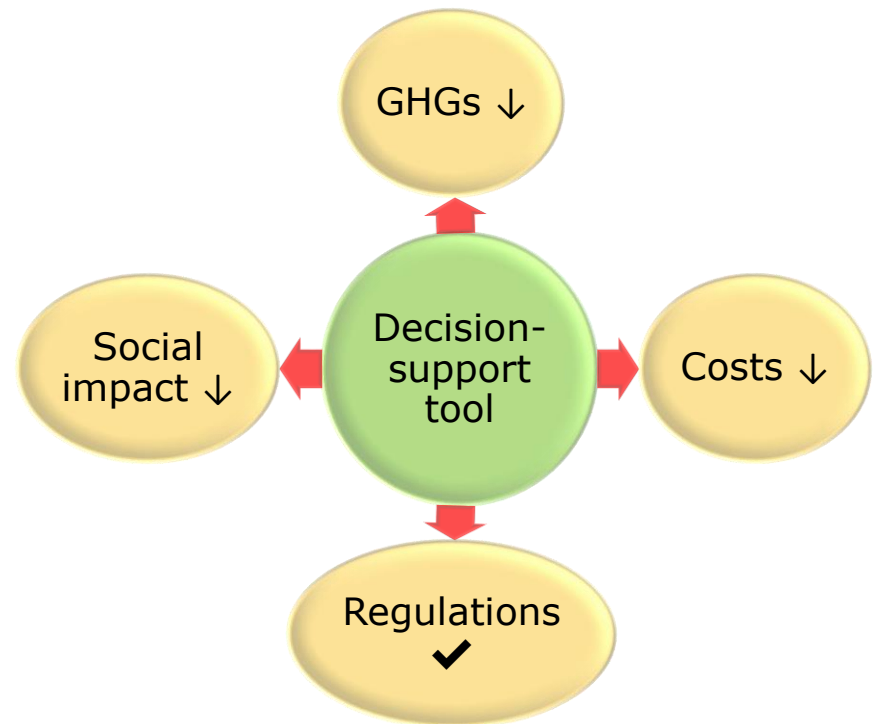
=> A holistic approach to planning and optimization of waste valorization projects is required!

COLLABORATIVE RESEARCH PROJECT



Project objectives

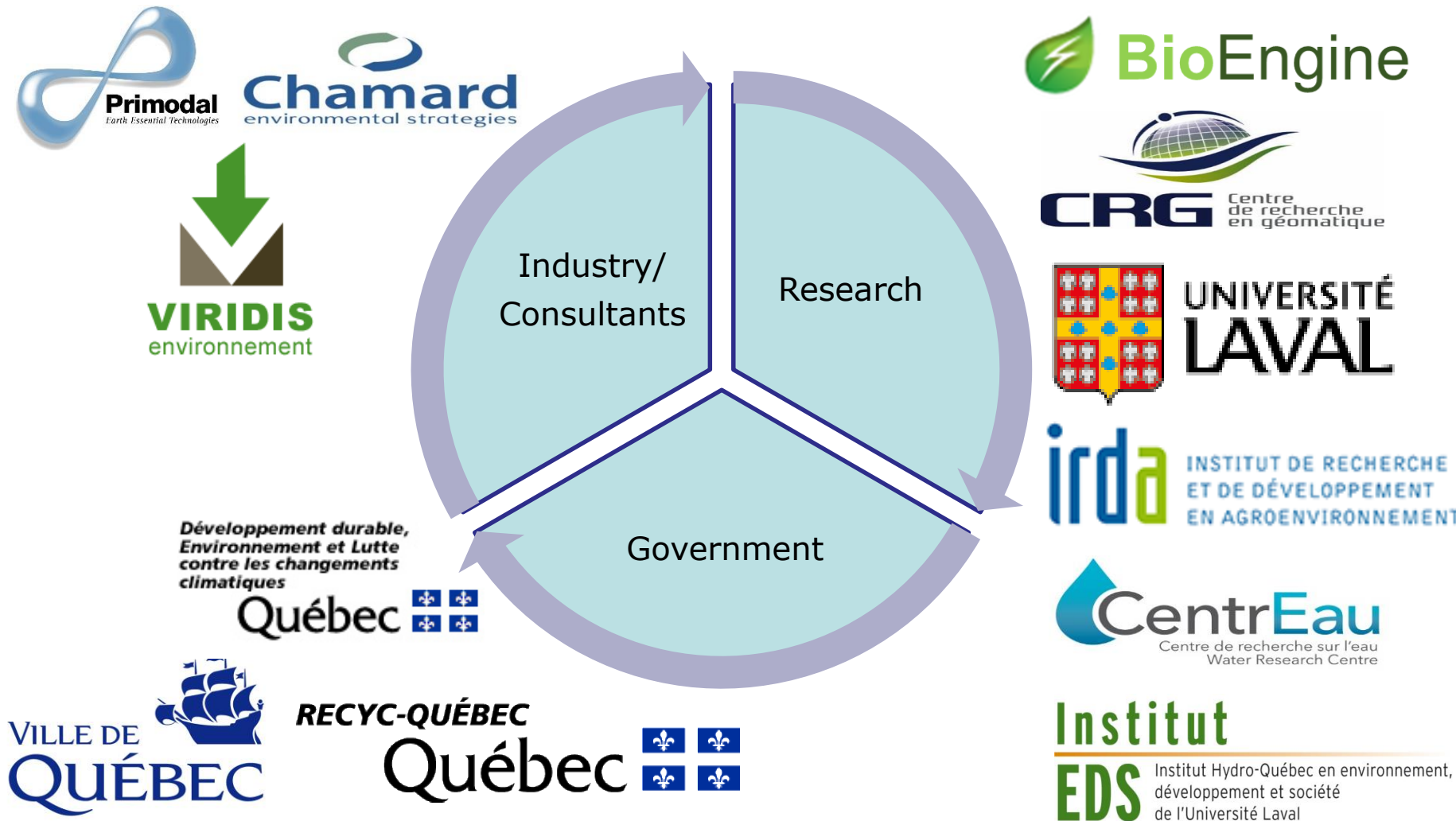
1. To develop a user-friendly decision-support software tool that allows setting up **optimal** organic waste valorization chains for the Québec province, including **energy and nutrient recovery and recycling**;
2. To validate the tool in a case study for the Québec City agglomeration and its surrounding rural environment.



Project scope



Nutrient Stakeholder Platform Québec



Anticipated benefits

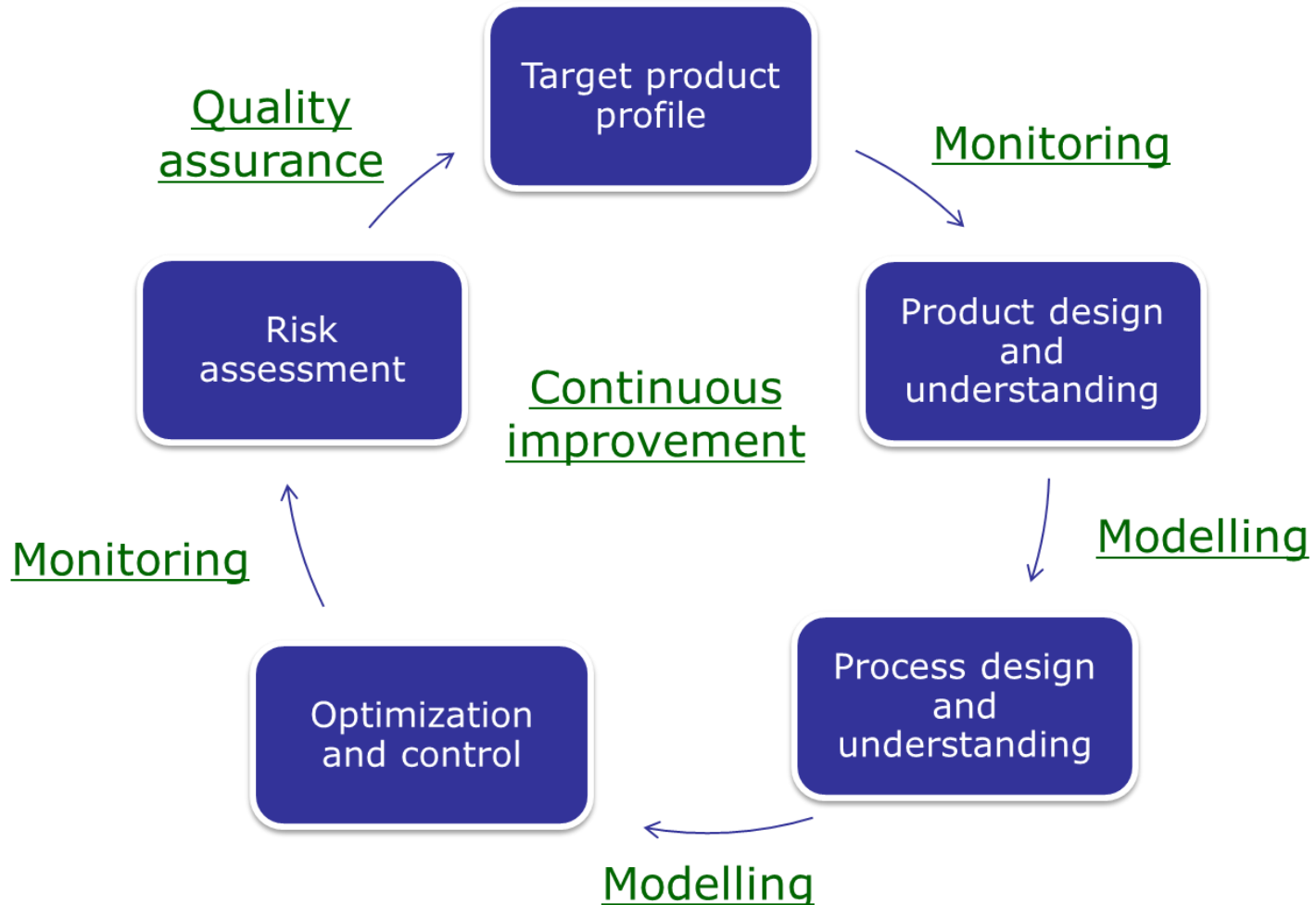
- **Circular economy:**
 - local fertilizer supply ↑
 - profitability of organic waste valorization projects ↑
 - agricultural crop yields ↑
- **Environment:**
 - GHG emissions ↓
 - nutrient losses in the environment ↓
 - nutrient application in nutrient-saturated regions ↓
- **Society:**
 - establishment of closed links between urban and rural areas to support food security
 - traffic and odor nuisance ↓
 - acceptability of waste recycling in agriculture ↑



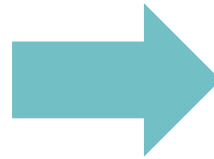
OTHER INITIATIVES

Canada Research Chair on Resource Recovery and Bio-Products Engineering

Quality by Design approach focusing on the end-user



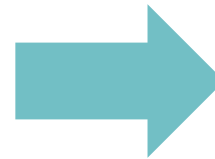
**Production of new fertilizer formulations
and non-fertilizer products from manure
using ion exchange nanotechnology
(provisional patent + Barley Prize Pilot Stage Finalist)**



Li-ion battery
cathode material

Collaboration with ESSRE Inc. (PA, USA)

Production of cleaning products from sewage sludge



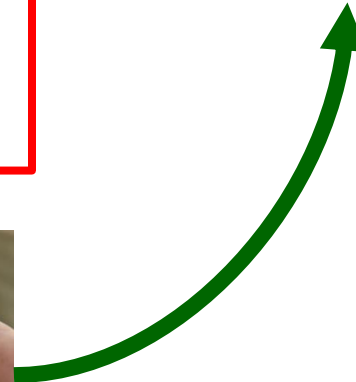
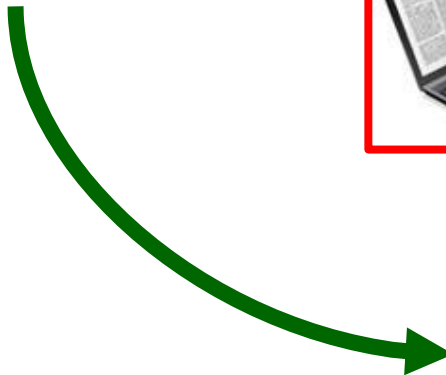
Collaboration with UTB EnviroTec (HU)



TAKE-HOME MESSAGE

Numerical technology is a must for planning and optimizing the value chain!

« *Nothing is lost, nothing is created, everything is transformed!* »





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<https://bioengineblog.wordpress.com/>