

# Strategies for reusing canal sediments in the Scottish Circular Economy

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Scottish  
Canals

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@ScottishCanal

s

Safeguarding our heritage.  
Building our future.



# Scottish Canals

**7766**  
mega litres of  
water in canals

**19**  
reservoirs  
800 hectares of water  
825 hectares of land

**92** buildings  
worthy of statutory  
protection

**Crinan Canal**

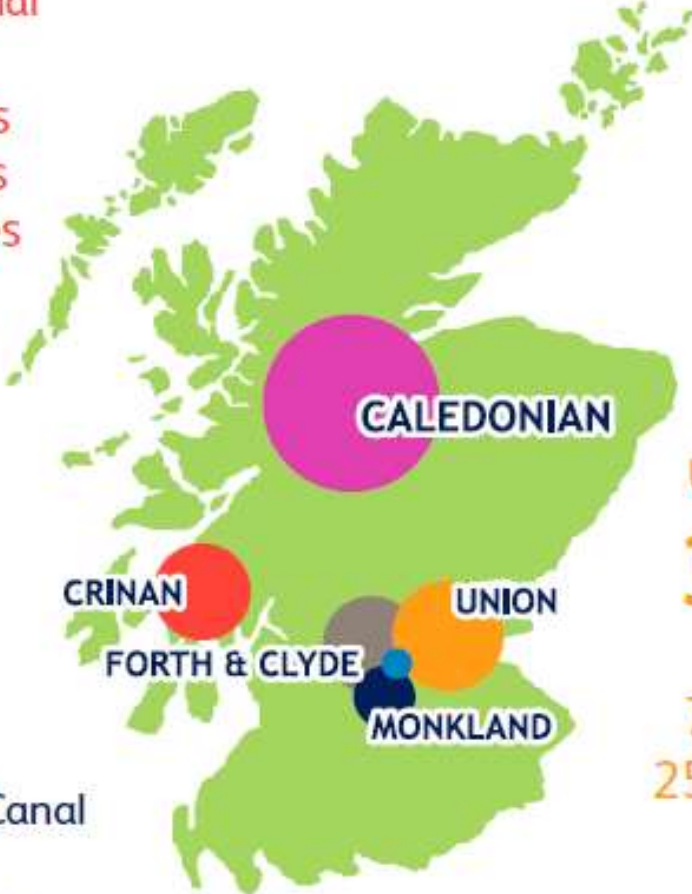
**9** miles  
15 locks  
7 bridges

**Caledonian Canal**

**29** locks  
4 aquaducts  
8 road bridges  
2 rail bridges

**Forth & Clyde Canal**

**35** miles  
41 locks  
58 bridges



**Union Canal**

**32** miles  
2 locks  
72 bridges  
25 aqueducts

Almost 500k  
visitors to the Falkirk  
Wheel every year

**Monkland Canal**

**12** miles  
6 bridges

Figure 1: Scottish Canals map, facts and figures  
Source: Scottish Canals



# Scottish Canals

We are  
here →



**Launch**

**Growth**

**Maturity**

**Decline**

**Launch**

**Growth...**

1768

1790

1820

1900

2000





















Pinkston

Water  
sports

Pinkston  
Water  
sports

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Water  
sports

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Water  
sports

outwardbound.org.uk



# Bringing North Glasgow to Life



Scottish Water  
Always serving Scotland

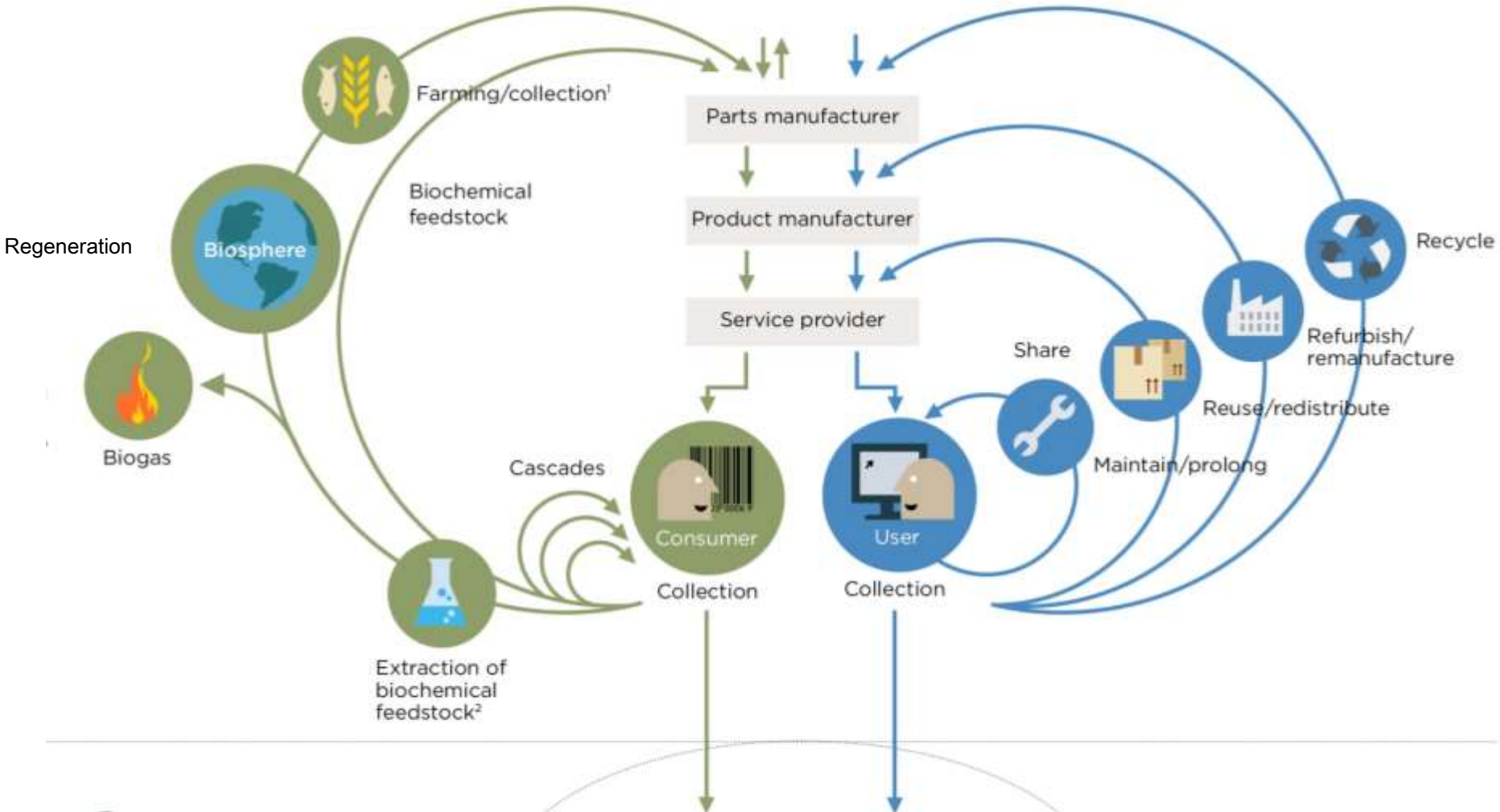


Renewables   Finite materials

Regenerate Substitute materials Virtualise Restore

Renewables flow management

Stock management





# Scottish Circular Economy Strategy 2016



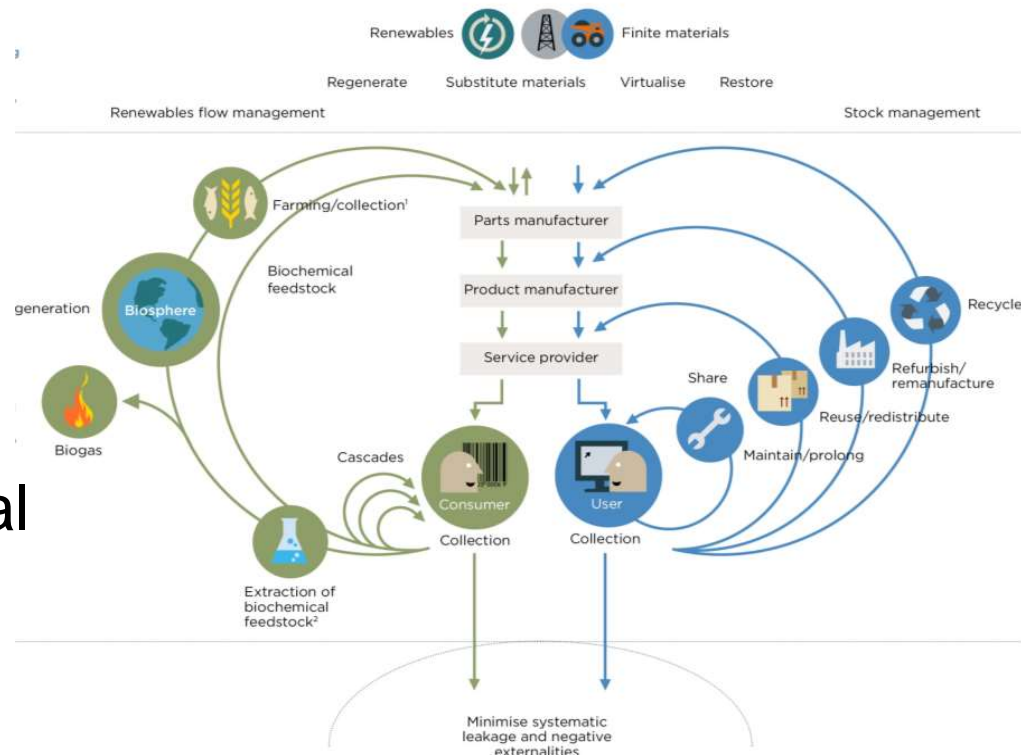
- Scotland first country to join EMF CE100 programme in 2013
- A more circular economy could reduce C emissions by 11 MT pa by 2050
- £620M additional turnover and 5,700 new jobs by 2020
- Focus: food, bio-economy, energy infrastructure, construction sectors (last is 50% of total waste)
- Reduce food waste by 33% by 2025

## Making Things Last

A Circular Economy Strategy for Scotland

# Challenges (opportunities) for Circular Economy applied to sediments

- What are the “restorative & regenerative” options for dredged sediments?
  - Use in bank repairs?
  - Replacing eroded soils?
  - Contaminant removal?
- Renewable energy recovery?
- Soil/nutrients for bio-based economy?
- Preserve/enhance natural capital (eco-system services)



# Scottish Canals

Knowledge Transfer Partnership 2012-15



## Scottish Canals Knowledge Transfer Partnership

“To embed an environmentally sustainable approach to sediment management, reducing operational costs, generating opportunities for revenue growth and addressing emerging waste legislation requirements”

Knowledge  
Transfer  
Partnerships



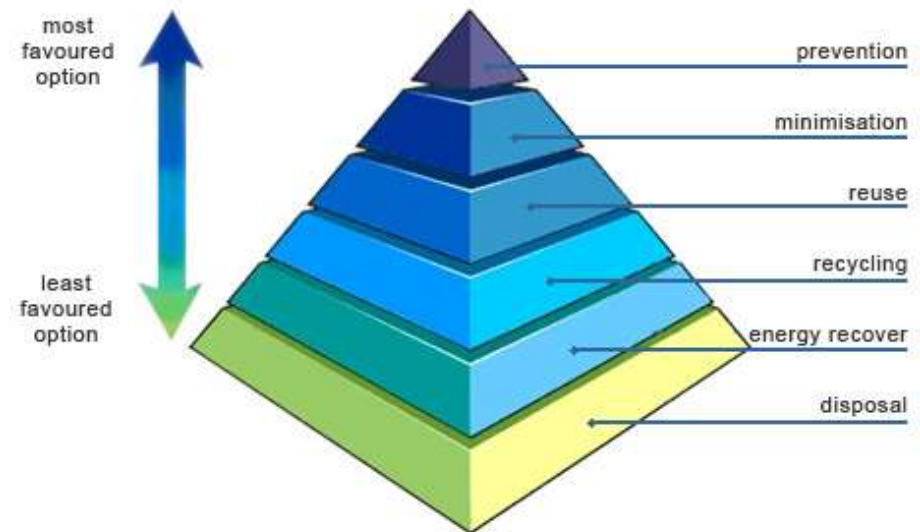
# The challenges

- Dredged sediments considered as “waste”
- EU Landfill Directive, Regulations and Landfill Tax makes landfilling “waste” costly
- Scotland’s Zero Waste Plan (2010): 70% recycling, 5% landfill by 2025
- Distributed, potentially contaminated, liquifaction on transport
- Uncontaminated treated as inert waste (but more likely non-haz)

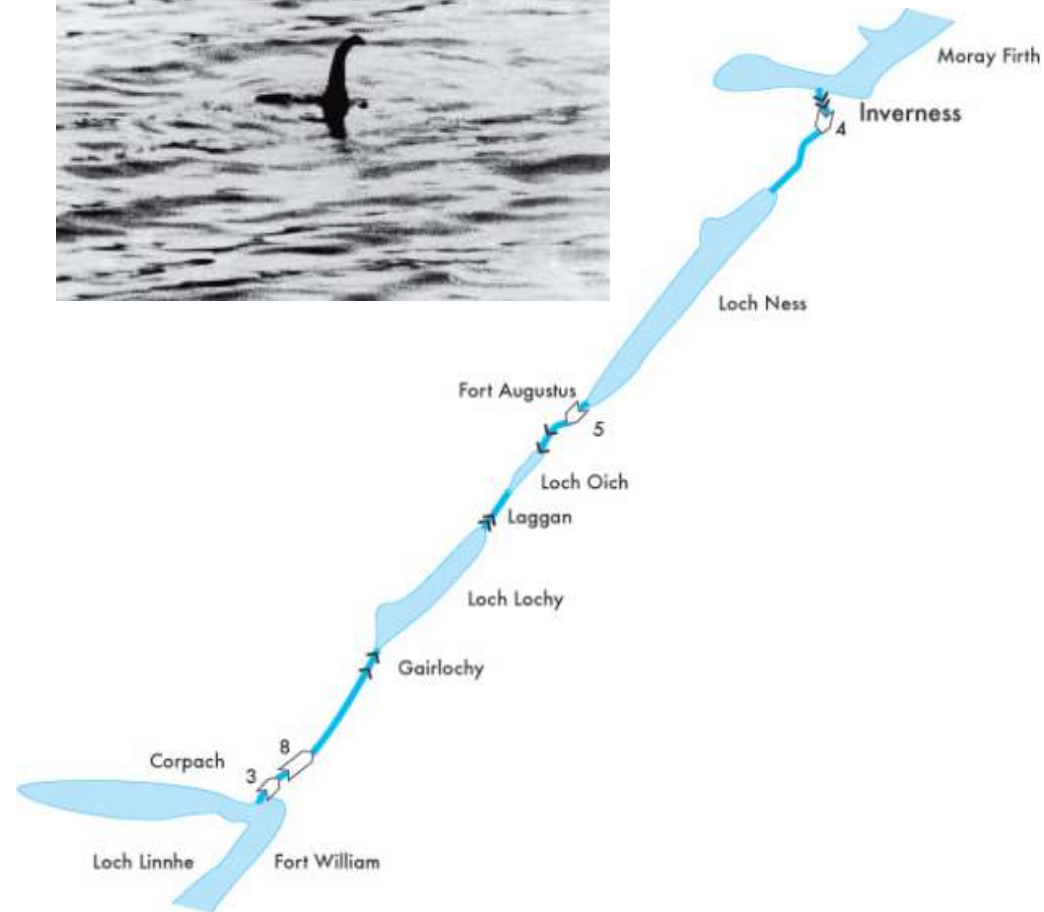


# Waste hierarchy approach

- **Reduction:**  
preventing siltation &  
targeting dredging
- **Reuse:** of materials
- **Recycling:**  
processing of  
materials for  
recyclates
- Renewable **energy  
recovery**



# Reduction: (1) Plough dredging in lochs on Caledonian Canal



## (2) Targeted spot dredging





# (3) In-house dredging capability ( $\neq$ landfill)



# Reuse: (1) Bankside restoration under exemption Mar '14



Jun '14



Sept '14



Jan '15



May '16



Jun '17





(2) Nicospan\* trial  
(with Scheduled  
Ancient Monument  
consent)

\*[www.greenfix.co.uk](http://www.greenfix.co.uk)





# Recycling (1) Pinkston Basin

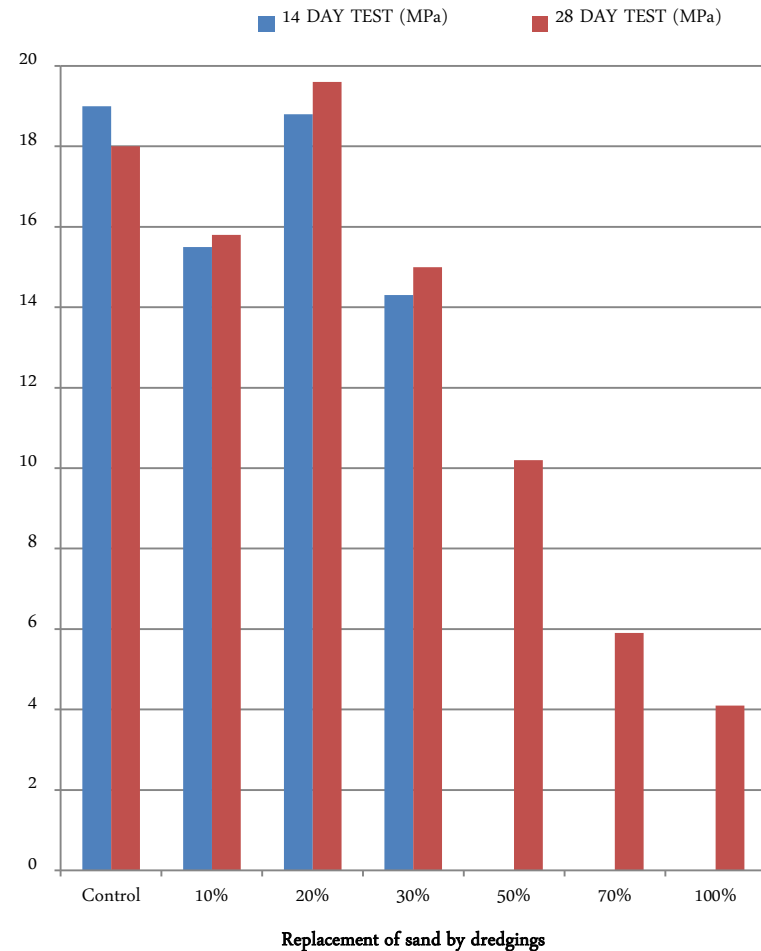




Two Brothers Friendship Priggie Nelly Fackel



# Pinkston Basin – cube tests



Cement (19), stone (45), sand (37)

# Recycling: (2) Co-composting & soil manufacture







LAND & WATER

JCB



CAUTION  
LORRIES  
TURNING

CAUTION

CAUTION

LAND

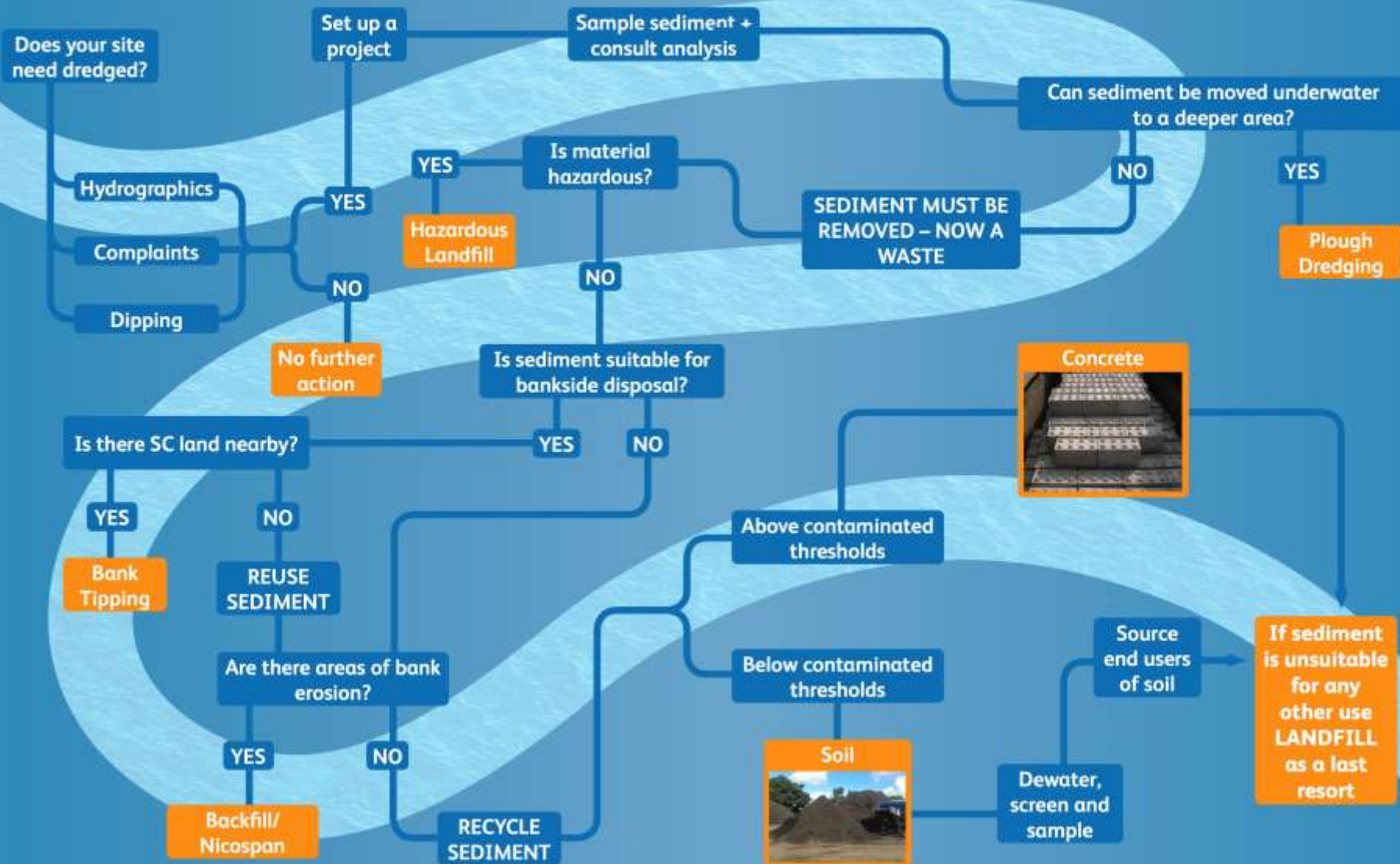








# HOW TO REUSE YOUR DREDGED SEDIMENT



# BioReGen Life Project 2005-10

Biomass

Remediation





(Re)Generation

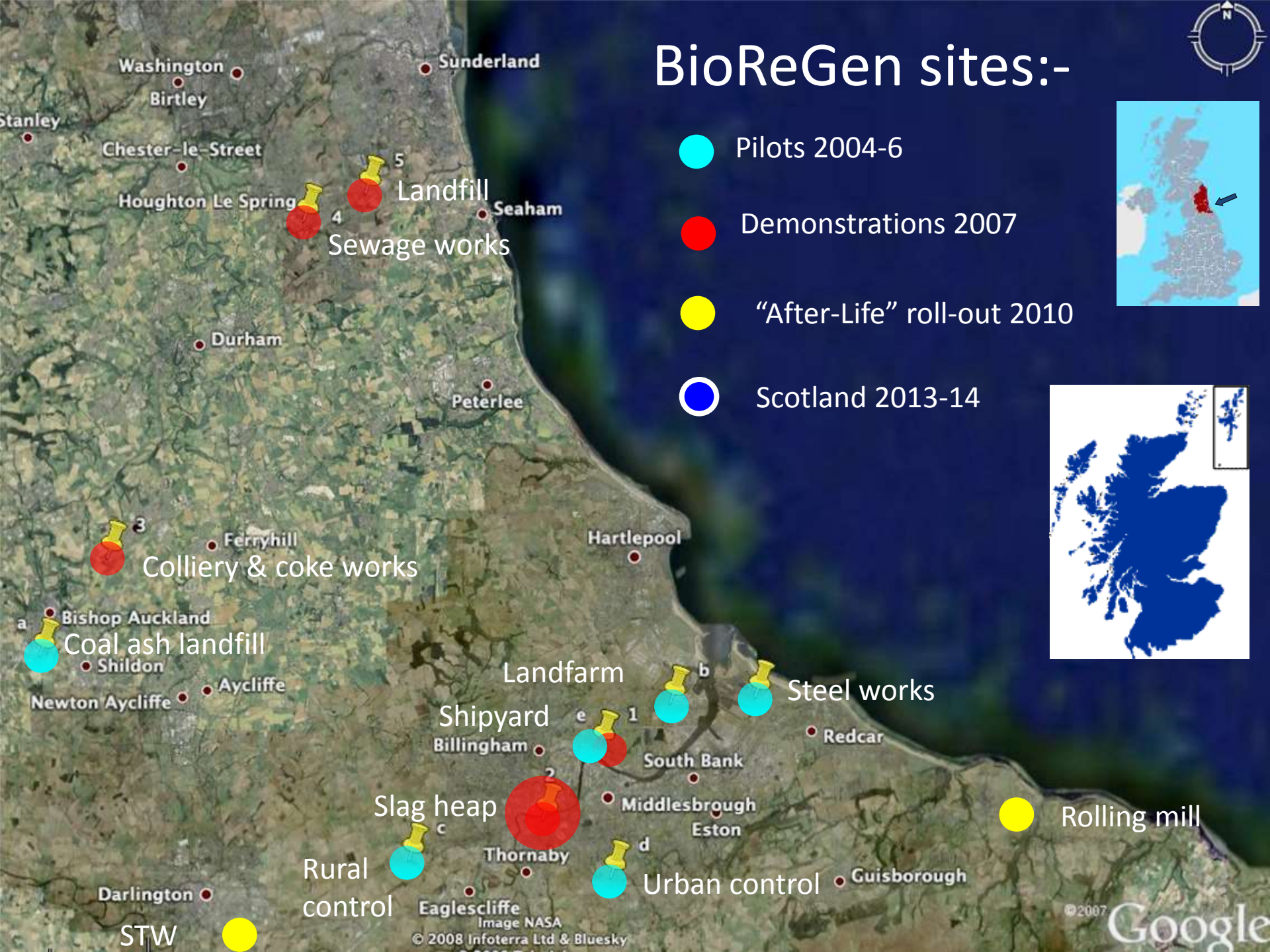
Re-using brownfield sites  
for renewable energy crops



# BioReGen sites:-



-  Pilots 2004-6
-  Demonstrations 2007
-  "After-Life" roll-out 2010
-  Scotland 2013-14



# Tees Barrage 2007-2012



Material change for  
a better environment



# Placed dredgings, Tees Barrage (2007)









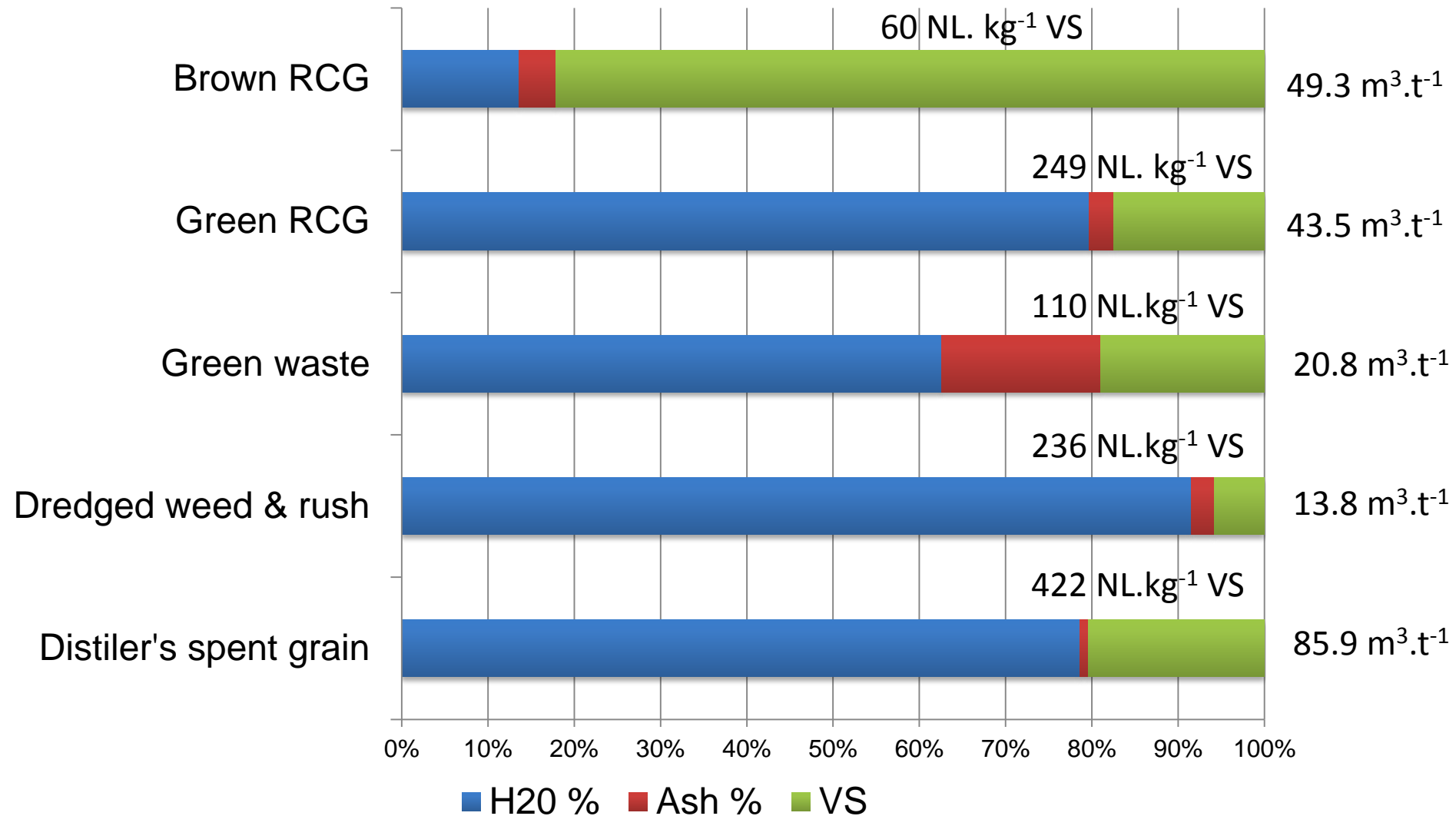
# Renewable Energy: (1) Bankside vegetation – *Phalaris arundinacea*



## (2) Weed cutting (the Berky)



# Methane yields (m<sup>3</sup> per wet tonne)



(3) Reuse dredgings to restore  
canalside brownfield land or landfills?

Then use to grow renewable fuels?





# (4) Future: Advanced phyto-conditioning?



Yorkshire Water using ryegrass (*Lolium multiflorum*) to de-water sewage sludge (or sediments), blended with chipped recovered wood & sand for reuse as soils.

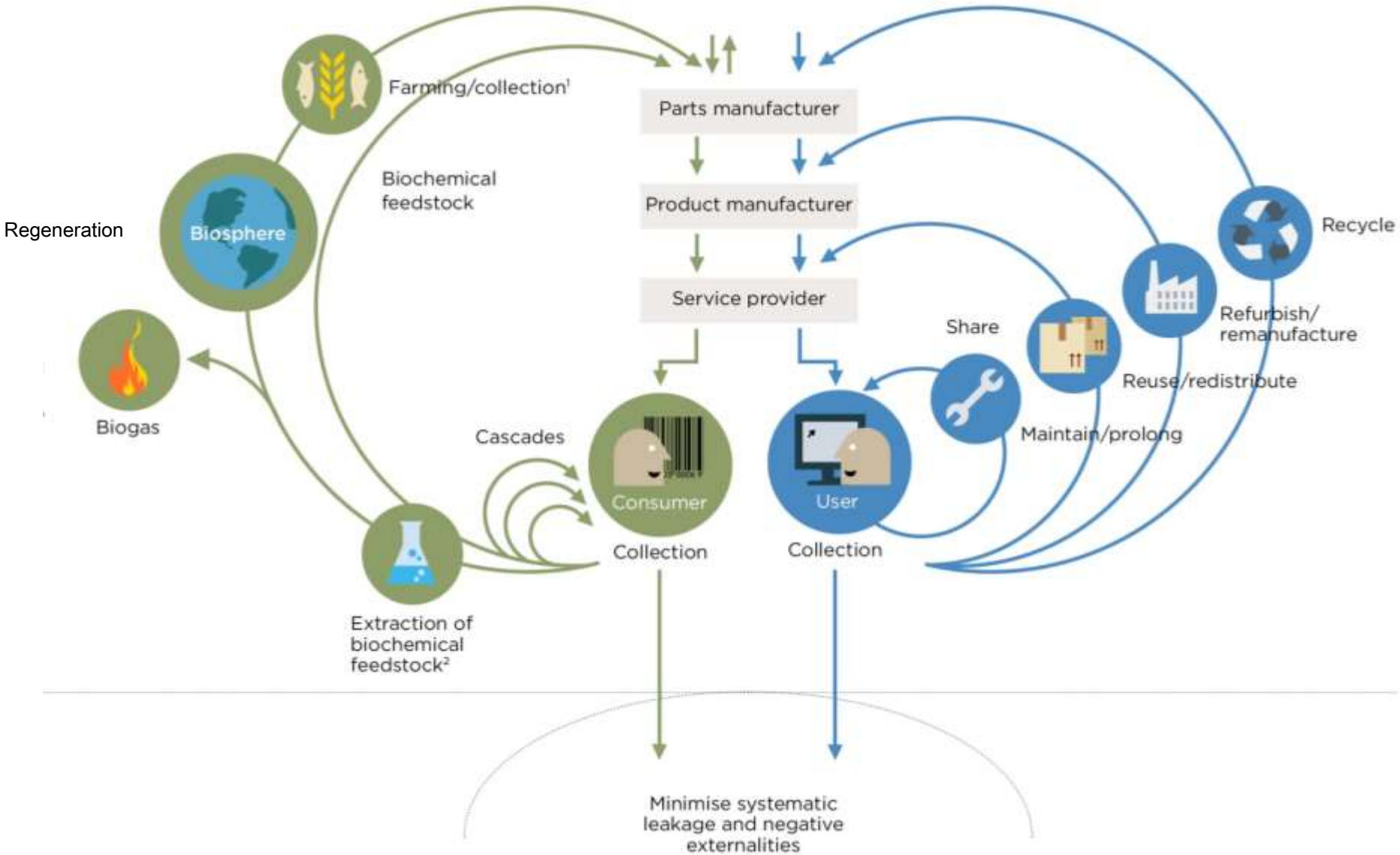


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