



Circular Economy in ports

Tim C. McAloone

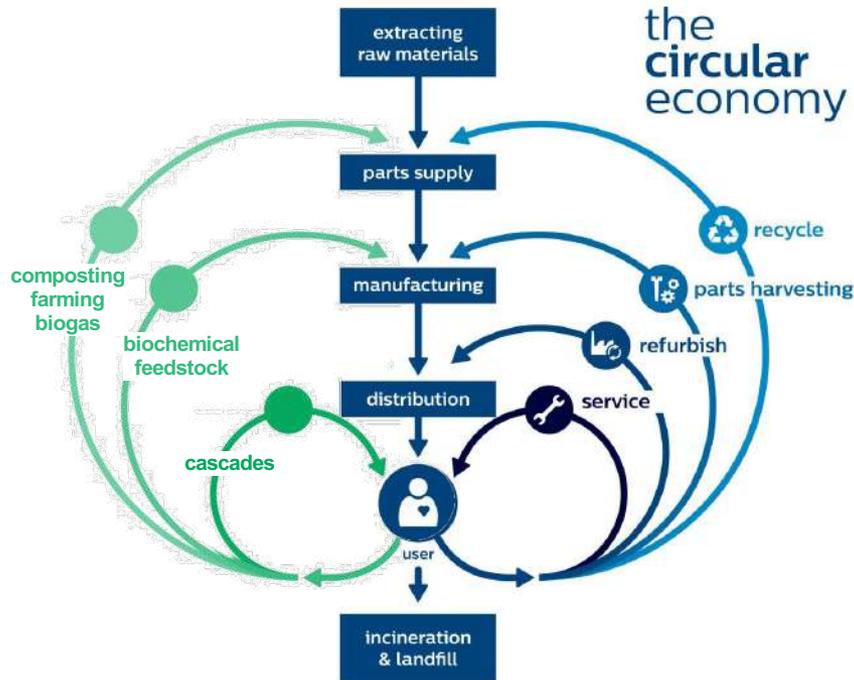
CIRCULAR ECONOMY

- Fastest growing business strategy area in Europe
- Closing the loops
- 1.8 trillion Euro per year in Europe
- Decoupling value creation from resource consumption
- Requires a systemic approach



But, it's not just about recycling!

Many different opportunities from CE



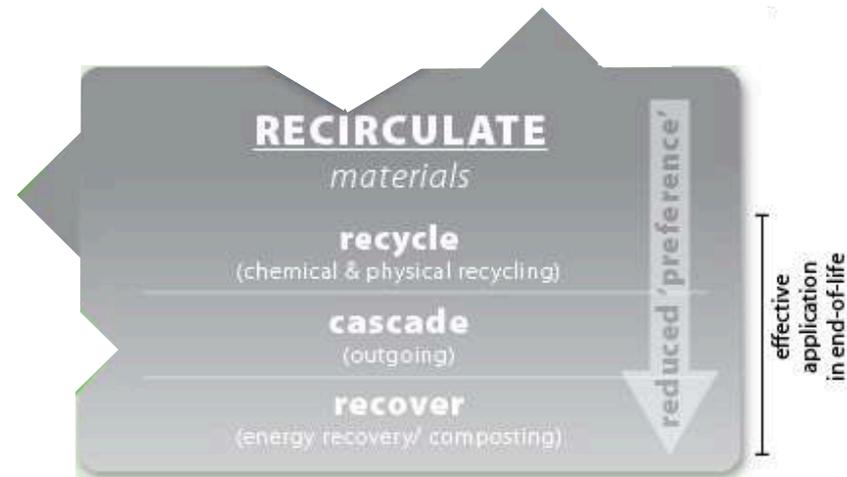
[The "Butterfly Diagram" of CE, adapted from Philips]

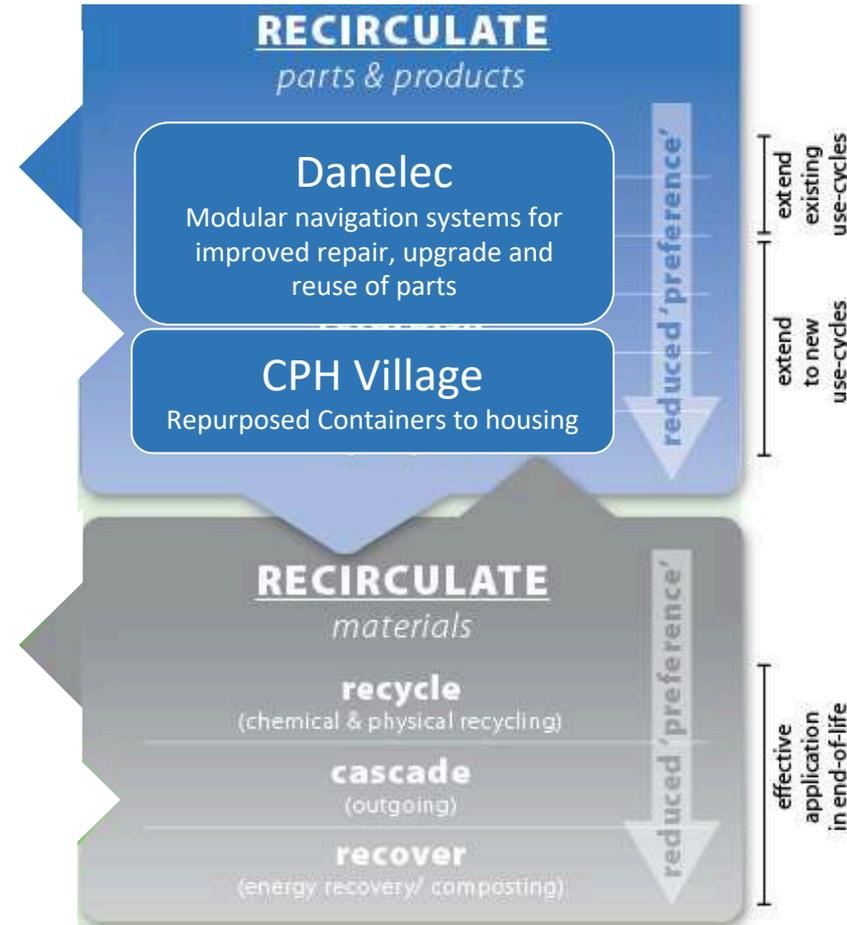




Abandoned, lost or disposed of **fishing** gear accounts for about a third of marine litter found in **European** seas, or over 11,000 tonnes per year. Almost half of the “great **garbage** patch” in the Pacific Ocean consists of such **fishing** gear. We estimate that in the **EU**, 20% of gear is lost at sea.







A close-up photograph of a hand inserting a green SWAP technology module into a slot on the back of a silver electronic device. The device has various ports and connectors, including a USB port, a D-sub connector, and a green connector. The background is dark, and the lighting highlights the hand and the module.

Maximize uptime

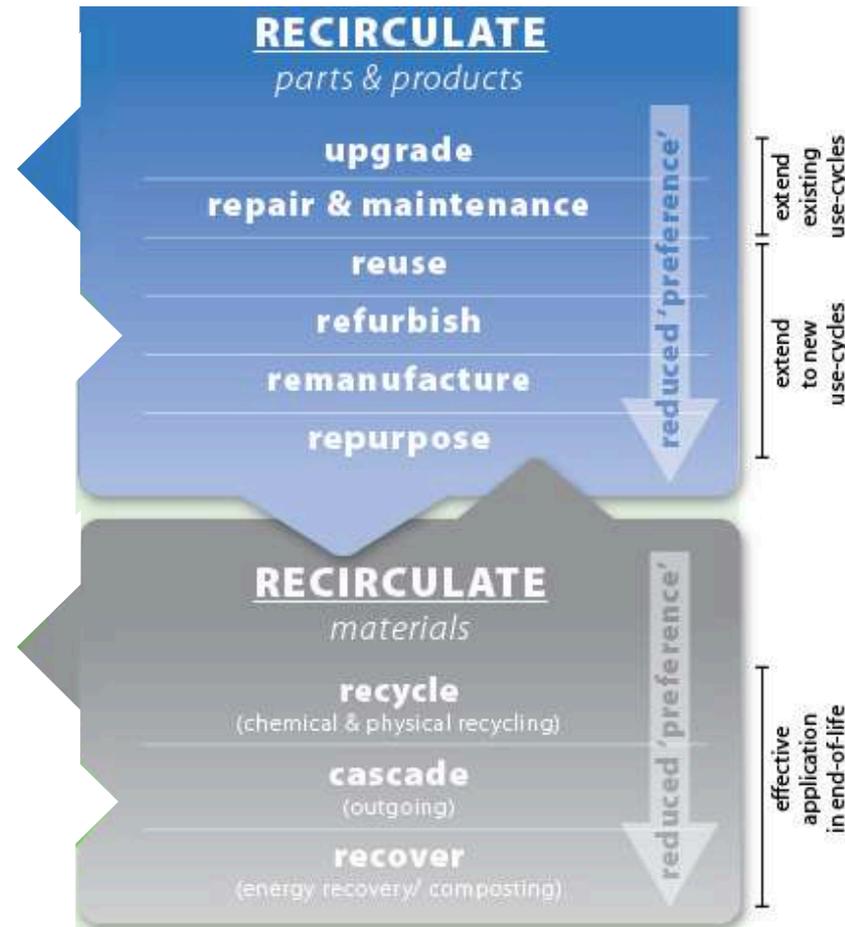
Rest assured your ship sails on schedule

Our exclusive **SWAP technology™** enables fast and easy replacement of equipment in case of failure, without reinstalling software and reconfiguring the system

danelec
MARINE

CPH VILLAGE





RESTORE, REDUCE & AVOID

impact in the areas of:

*raw materials
& sourcing
such as:*

- renewables**
- recyclable materials**
- secondary source sourcing**
- restorative sourcing**
- non-toxic & benign materials**
- lowest suitable grade**

*manufacturing
such as:*

- lean manufacturing & cleaner production**
- rework**
(pre-user refurbish or remanufacture)
- recycle**
(pre-user)
- cascade**
(Industrial Symbiosis)
- recover**
(energy recovery/ composting)

*product use
& operation
such as:*

- Konecranes**
Predictive maintenance
- Onshore power**
- Viking**
management and sharing of equipment between vessels

RECIRCULATE

parts & products

- upgrade**
- repair & maintenance**
- reuse**
- refurbish**
- remanufacture**
- repurpose**

reduced 'preference'

extend existing use-cycles
extend to new use-cycles

RECIRCULATE

materials

- recycle**
(chemical & physical recycling)
- cascade**
(outgoing)
- recover**
(energy recovery/ composting)

reduced 'preference'

effective application in end-of-life

KONECRANES®

KONECRANES
30 t

Predictive maintenance utilises condition monitoring, advanced inspections, and data analytics to predict component or equipment failure.

RESTORE, REDUCE & AVOID

impact in the areas of:

*raw materials
& sourcing
such as:*

renewables

**recyclable
materials**

**secondary
source
sourcing**

**restorative
sourcing**

**non-toxic
& benign
materials**

**lowest
suitable
grade**

*manufacturing
such as:*

**lean
manufacturing
&
cleaner
production**

rework
(pre-user refurbish
or remanufacture)

recycle

**Industrial
symbiosis**
eg. Kalundborg

(energy recovery/
composting)

*product use
& operation
such as:*

**product
longevity**

**low
consumables**
(energy, water,
materials)

**use idle
product
capacity**

RECIRCULATE

parts & products

**upgrade
repair & maintenance**

reuse

refurbish

remanufacture

repurpose

reduced 'preference'

extend
existing
use-cycles

extend
to new
use-cycles

RECIRCULATE

materials

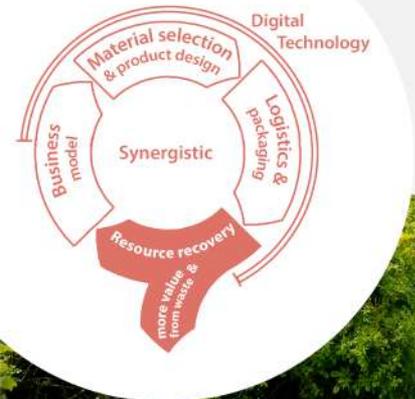
recycle
(chemical & physical recycling)

cascade
(outgoing)

recover
(energy recovery/ composting)

reduced 'preference'

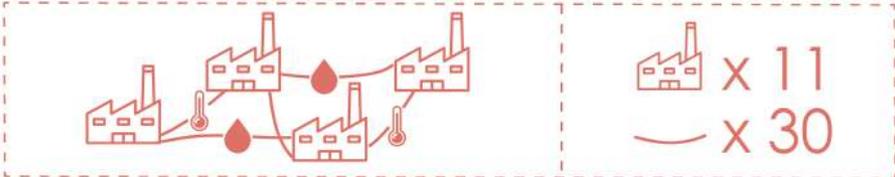
effective
application
in end-of-life



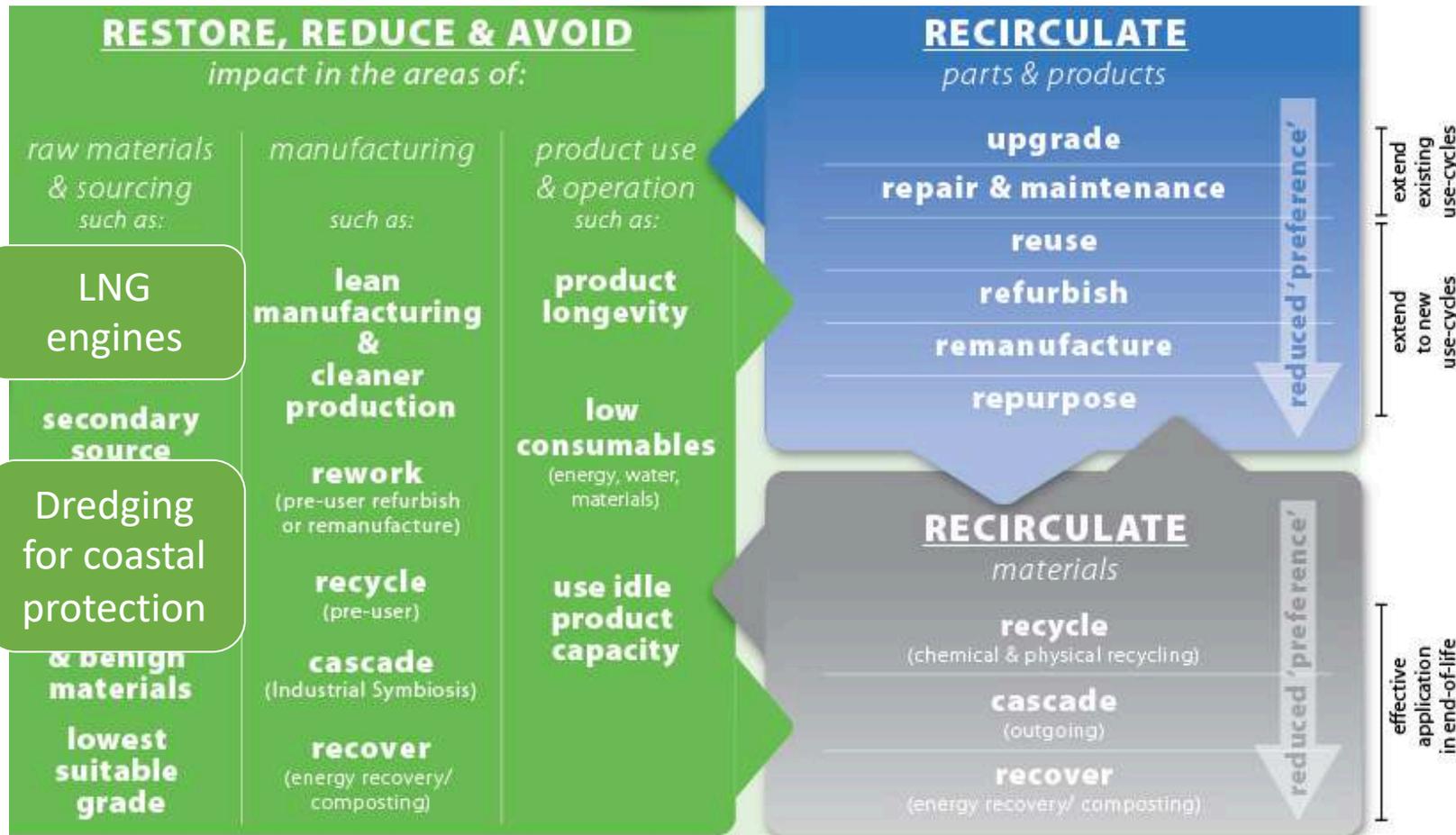
#26 Kalundborg Symbiosis! Manufacturing by-products become resources



In the Danish town of Kalundborg, one can find **the world's first large-scale industrial symbiosis scheme**, where various manufacturing facilities **exchange by-products**.



Read more about this and other Nordic cases of circular economy at **circitnord.com**



Rohde Nielsen A/S applies three methods of protecting the coast in the most environmentally friendly way.

Either we pump sand on the beach using a floating or submerged pipeline, or we pump dredged material directly out over the bow of the ship to the fore shore, also referred to as The Rainbow Method. Thirdly, we can dump sand close to the shore using our state-of-the-art split hopper dredgers.



Rohde Nielsen A/S



RESTORE, REDUCE & AVOID

impact in the areas of:

*raw materials
& sourcing
such as:*

renewables

**recyclable
materials**

**secondary
source
sourcing**

**restorative
sourcing**

**non-toxic
& benign
materials**

**lowest
suitable
grade**

*manufacturing
such as:*

**lean
manufacturing
&
cleaner
production**

rework
(pre-user refurbish
or remanufacture)

recycle
(pre-user)

cascade
(Industrial Symbiosis)

recover
(energy recovery/
composting)

*product use
& operation
such as:*

**product
longevity**

**low
consumables**
(energy, water,
materials)

**use idle
product
capacity**

RECIRCULATE

parts & products

**upgrade
repair & maintenance**

reuse

**refurbish
remanufacture**

repurpose

reduced 'preference'

extend
existing
use-cycles

extend
to new
use-cycles

RECIRCULATE

materials

recycle
(chemical & physical recycling)

cascade
(outgoing)

recover
(energy recovery/
composting)

reduced 'preference'

effective
application
in end-of-life

Rolls Royce
Power by the hour

Hempel
From selling coatings to selling reduced water resistance

aim for business innovation for circularity

RESTORE, REDUCE & AVOID
impact in the areas of:

raw materials & sourcing such as:

- renewables**
- recyclable materials**
- secondary source sourcing**
- restorative sourcing**
- non-toxic & benign materials**
- lowest suitable grade**

manufacturing such as:

- lean manufacturing & cleaner production**
- rework**
(pre-user refurbish or remanufacture)
- recycle**
(pre-user)
- cascade**
(Industrial Symbiosis)
- recover**
(energy recovery/ composting)

product use & operation such as:

- product longevity**
- low consumables**
(energy, water, materials)
- use idle product capacity**

RECIRCULATE
parts & products

- upgrade**
- repair & maintenance**
- reuse**
- refurbish**
- remanufacture**
- repurpose**

reduced 'preference'

extend existing use-cycles
extend to new use-cycles

RECIRCULATE
materials

- recycle**
(chemical & physical recycling)
- cascade**
(outgoing)
- recover**
(energy recovery/ composting)

reduced 'preference'

effective application in end-of-life



Nor Lines and Rolls-Royce have signed a groundbreaking “Power-by-the-Hour” service agreement for the two vessels Kvitbjørn and Kvitnos. The new service offering harnesses the power of “Big Data” to monitor, plan and perform maintenance and repairs on all the equipment it has installed on the cargo vessels.

RETHINK & RECONFIGURE

value generation architecture

aim for business
innovation
for circularity

RESTORE, REDUCE & AVOID

impact in the areas of:

*raw materials
& sourcing
such as:*

renewables

**recyclable
materials**

**secondary
source
sourcing**

**restorative
sourcing**

**non-toxic
& benign
materials**

**lowest
suitable
grade**

*manufacturing
such as:*

**lean
manufacturing
&
cleaner
production**

rework
(pre-user refurbish
or remanufacture)

recycle
(pre-user)

cascade
(Industrial Symbiosis)

recover
(energy recovery/
composting)

*product use
& operation
such as:*

**product
longevity**

**low
consumables**
(energy, water,
materials)

**use idle
product
capacity**

RECIRCULATE

parts & products

**upgrade
repair & maintenance**

reuse

refurbish

remanufacture

repurpose

reduced 'preference'

extend
existing
use-cycles

extend
to new
use-cycles

RECIRCULATE

materials

recycle
(chemical & physical recycling)

cascade
(outgoing)

recover
(energy recovery/
composting)

reduced 'preference'

effective
application
in end-of-life

change of paradigm

RETHINK & RECONFIGURE

value generation architecture

aim for business innovation for circularity

RESTORE, REDUCE & AVOID

impact in the areas of:

<i>raw materials & sourcing</i> such as: renewables recyclable materials secondary source sourcing restorative sourcing non-toxic & benign materials lowest suitable grade	<i>manufacturing</i> such as: lean manufacturing & cleaner production rework (pre-user refurbish or remanufacture) recycle (pre-user) cascade (Industrial Symbiosis) recover (energy recovery/ composting)	<i>product use & operation</i> such as: product longevity low consumables (energy, water, materials) use idle product capacity
---	---	--

RECIRCULATE

parts & products

- upgrade
- repair & maintenance
- reuse
- refurbish
- remanufacture
- repurpose

reduced 'preference'

extend existing use-cycles

extend to new use-cycles

RECIRCULATE

materials

- recycle
(chemical & physical recycling)
- cascade
(outgoing)
- recover
(energy recovery/ composting)

reduced 'preference'

effective application in end-of-life

prevent excess, improve efficiency and aim for 'gentani', improve circularity potential

Autonomous or zero-emission vessels

logistics

The vessel YARA Birkeland will be the world's first fully electric and autonomous container ship, with zero emissions. KONGSBERG is responsible for development and delivery of all key enabling technologies including the sensors and integration required for remote and autonomous ship operations, in addition to the electric drive, battery and propulsion control systems.



change of paradigm

REINVENT

strive for full decoupling

RETHINK & RECONFIGURE

value generation architecture

aim for business innovation for circularity

RESTORE, REDUCE & AVOID

impact in the areas of:

raw materials & sourcing
such as:

- renewables
- recyclable materials
- secondary source sourcing
- restorative sourcing
- non-toxic & benign materials
- lowest suitable grade

manufacturing
such as:

- lean manufacturing & cleaner production
- rework (pre-user refurbish or remanufacture)
- recycle (pre-user)
- cascade (Industrial Symbiosis)
- recover (energy recovery/ composting)

product use & operation
such as:

- product longevity
- low consumables (energy, water, materials)
- use idle product capacity

RECIRCULATE

parts & products

- upgrade
- repair & maintenance
- reuse
- refurbish
- remanufacture
- repurpose

reduced 'preference'

extend existing use-cycles

extend to new use-cycles

RECIRCULATE

materials

- recycle (chemical & physical recycling)
- cascade (outgoing)
- recover (energy recovery/ composting)

reduced 'preference'

effective application in end-of-life

prevent excess, improve efficiency and aim for 'gentani', improve circularity potential

logistics

CIRCULAR ECONOMY ... IN PORTS

- Fastest growing business strategy area in Europe ⇒ • How does it look for Danish ports?
- Closing the loops ⇒ • In which areas could we close loops?
- 1.8 trillion Euro per year in Europe ⇒ • How much potential in ports?
- Decoupling value creation from resource consumption ⇒ • As service-hubs, ports have a good start
- Requires a systemic approach ⇒ • How to create the system & infrastructure?

