

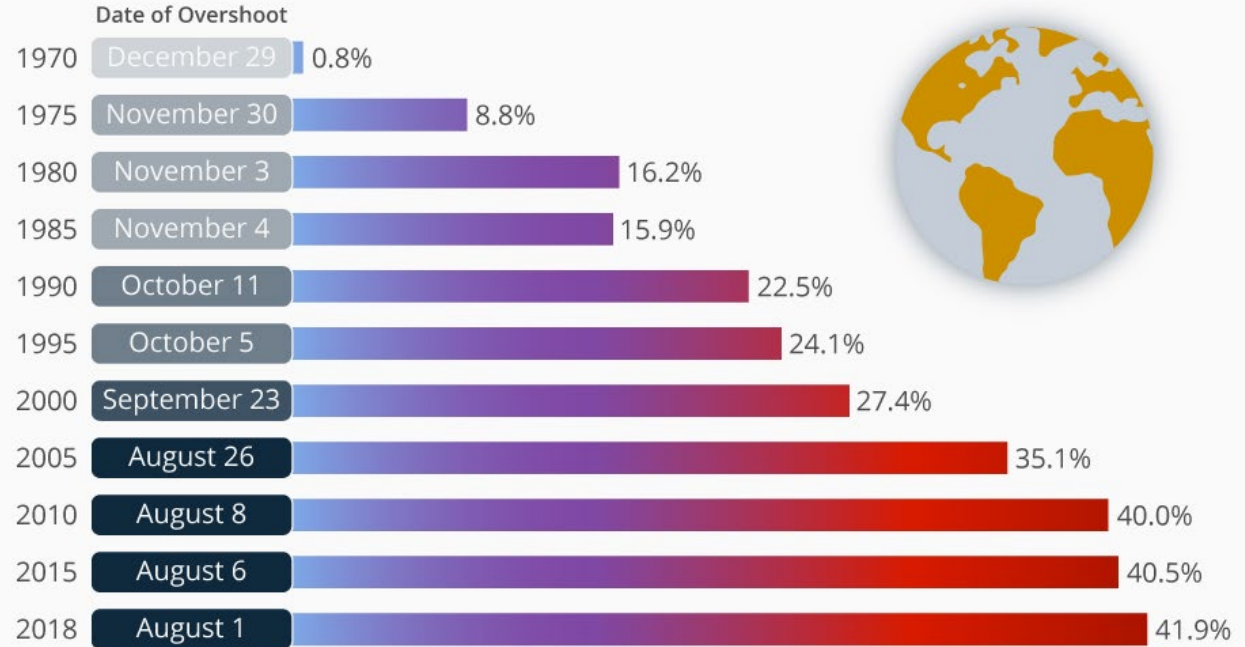


Can Circular Economy thinking  
transform the water sector?

Europeans  
(only) need  
between  
2-3 planets  
worth of  
resources  
to sustain  
their lifestyles

## Earth Overshoot Day Comes Sooner Every Year

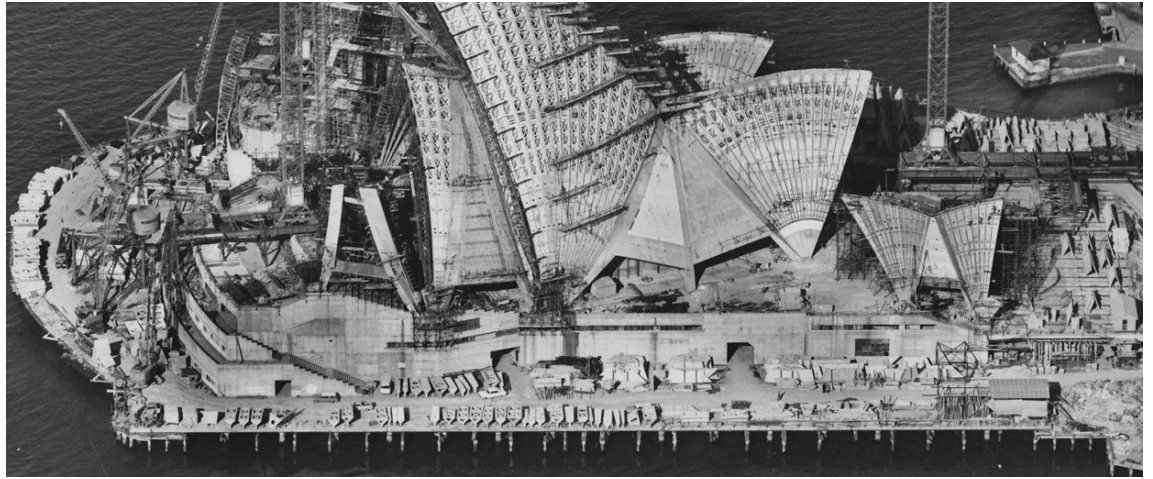
Share of year remaining after Earth Overshoot Day (1970–2018)



@StatistaCharts

Source: Earth Overshoot Day

statista



Ove Arup

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FROM PRINCIPLES TO PRACTICES:  
FIRST STEPS TOWARDS A  
CIRCULAR BUILT ENVIRONMENT



Circularity Lab  
Arup | Google | EMF



Dame Ellen MacArthur

## THE CIRCULAR ECONOMY OPPORTUNITY FOR URBAN & INDUSTRIAL INNOVATION IN CHINA



ARUP

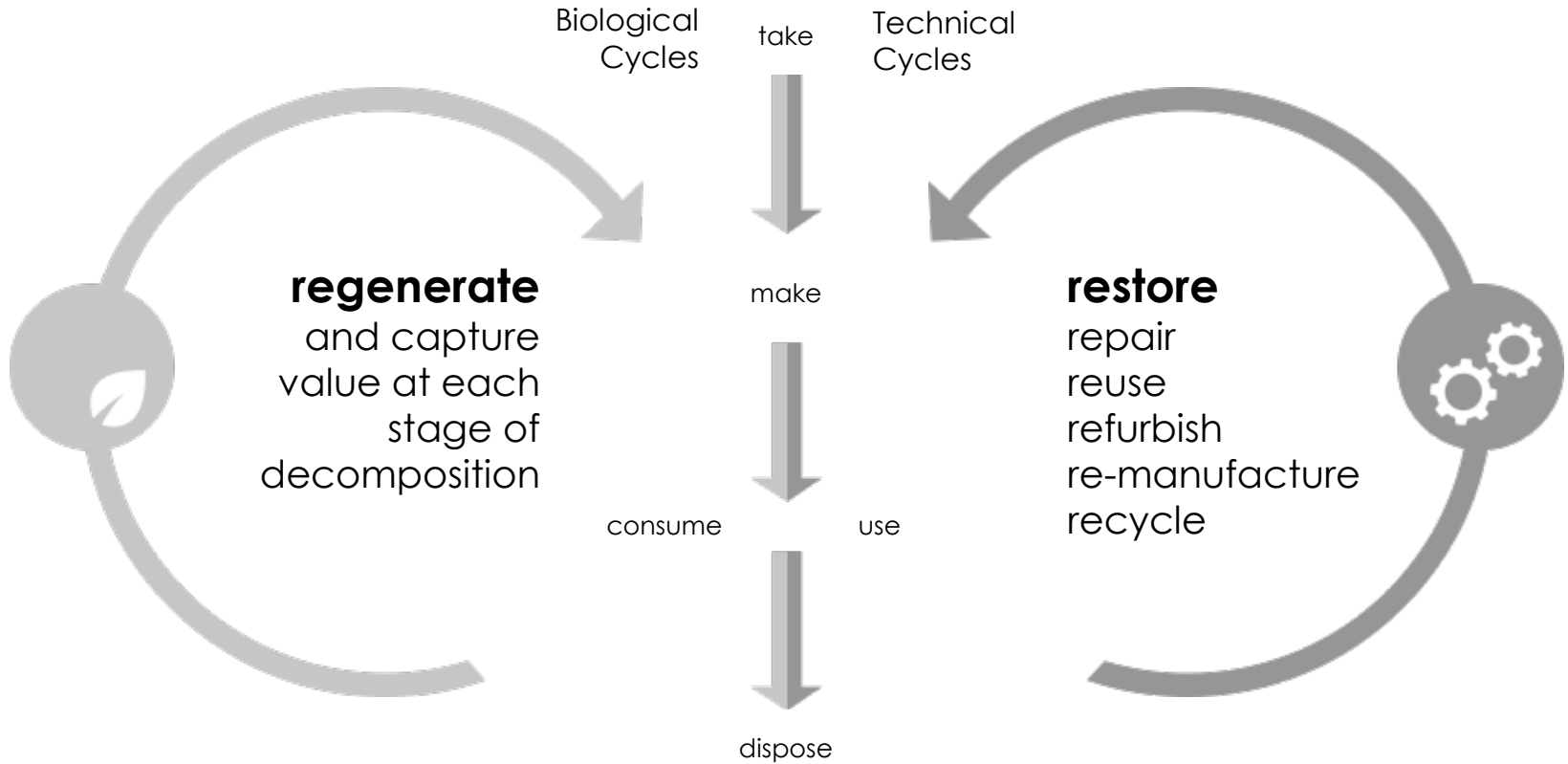




Beyond the current  
"take, make and  
dispose" extractive  
industrial model,  
the Circular  
Economy is  
restorative and  
regenerative by  
design



# Renewables and finite materials



**Minimise systemic leakage & negative externalities**

# CIRCULAR ECONOMY AS A STRATEGY

## Need For Urgent Action



During the 20th century the use of natural resources rose at about **twice the rate of population growth**<sup>3</sup>



In the last decade we have seen a recoupling of economic growth with material use, with **more materials being used per unit of GDP**<sup>4</sup>



We extract over 84 billion tonnes of materials per year to meet the functional needs of society. Yet, **only 9% of these materials are cycled back into our economies**<sup>5</sup>



Estimates suggest that by 2050, if current trends continue, there will be **more plastic than fish in the ocean**<sup>6</sup>



Diseases caused by pollution were responsible for more than 9 million premature deaths in 2015 – **16% of deaths worldwide or three times more deaths than from AIDS, tuberculosis, and malaria combined**<sup>7</sup>

## Promising Solution



Circular economy provides a **\$4.5 trillion opportunity** by 2030 through avoiding waste, making businesses more efficient and creating new employment opportunities<sup>8</sup>



The Circular Economy is an important strategy to achieve SDG 12 on responsible consumption and production and is also critical to delivering **on 6 further related SDGs**



Reducing or reusing just one fourth of the current amount of food waste can feed **870 million hungry people in the world**<sup>9</sup>



Circular Economy has been shown to almost halve the number of years of anticipated **water shortages in water stressed regions of California**<sup>10</sup>



Circular Economy in India could lead to **82% less consumption of virgin materials** in transportation & vehicle manufacturing by 2050<sup>11</sup>

Circular

=

Avoiding waste



*/'prɪnsəpəl/*  
**PRIN-CI-PLE**

A rule or belief governing one's personal behavior.

**1**

Design out  
waste  
externalities

**2**

Keep  
resources in  
Use

**3**

Regenerate  
natural  
capital

Economy

=

Everything else



# Our start of the journey towards a CE



Arup's Circular Pavilion @London Design Festival (2016)



People's Pavilion @Dutch Design Week Eindhoven (2018)

IMPACT VIRTUAL SUMMIT

# INVESTING IN THE CIRCULAR ECONOMY

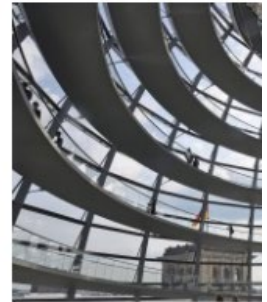
November 20-21, 201



The London Waste and Recycling Board (LWARB) has announced its intention to provide equity investment offering funding for venture and growth stage businesses that can lead to circular economy activities in London.

The expectation is that the new fund's focus will be on innovative technologies that improve waste management and new asset-light circular economy business models.

Innovative and new ideas often find securing investment challenging. The development of this private equity fund is based on the confidence that circular economy approaches do work, and that early stage investment is an important barrier to overcome.



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ONE TRILLION REASONS *Why We Need a Circular Economy*

INTESA S.p.A. SBNPAOLO

So what  
about the  
water sector?

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## Climate change: Water shortages in England 'within 25 years'

🕒 19 March 2019

f 🗨️ 🐦 ✉️ Share



<https://www.bbc.co.uk/news/uk-47620228>

PA

Low water levels at Wayoh Reservoir near Bolton in the UK heatwave in July 2018

**Within 25 years England will not have enough water to meet demand, the head of the Environment Agency is warning.**



# Genesis of Cities and their Water Systems



Supply Hydraulics

Separate Sewerage

Drainage Channels

Pollution Management

Waterways protection

Adaptive Multifunctional infrastructure & urban design

Designs our waste externalities.

Keeps resources in use.

Enhances natural capital

Service Delivery Functions

# White Paper Working Group



ARUP





# Principle 1: Design out waste externalities

(For systems interfacing with water)

- Optimise the amount of **energy, minerals, and chemicals** use in operation of water systems in concert with other systems.
- Optimise **consumptive use** of water within sub-basin in relation adjacent sub-basins (e.g. use in agriculture or evaporative cooling)
- Use measures or solutions which deliver the **same outcome without using water**





# Principle 2: Keep Resources in Use

(For systems interfacing with water)

- Optimise **resource yields** within water systems (water use & reuse, energy, minerals, and chemicals).
- Optimise energy or resource extraction (*organics, minerals, etc*) from the water system and maximise their **reuse**.
- Optimise value generated where water systems connect with other systems, such as 'water + **energy**' and 'water + **food**'.

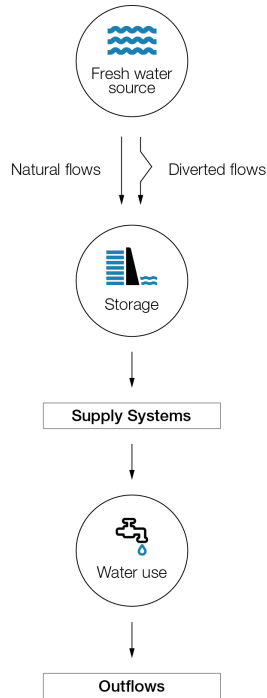
# Principle 3: Regenerate Natural Capital

(For systems interfacing with water)

- Maximise **environmental flows** by reducing consumptive and non-consumptive uses of water.
- **Preserve and enhance** the natural capital by river restoration, pollution prevention, and ensuring quality of effluent
- Ensure **minimum disruption** to natural water systems from human interactions and use.

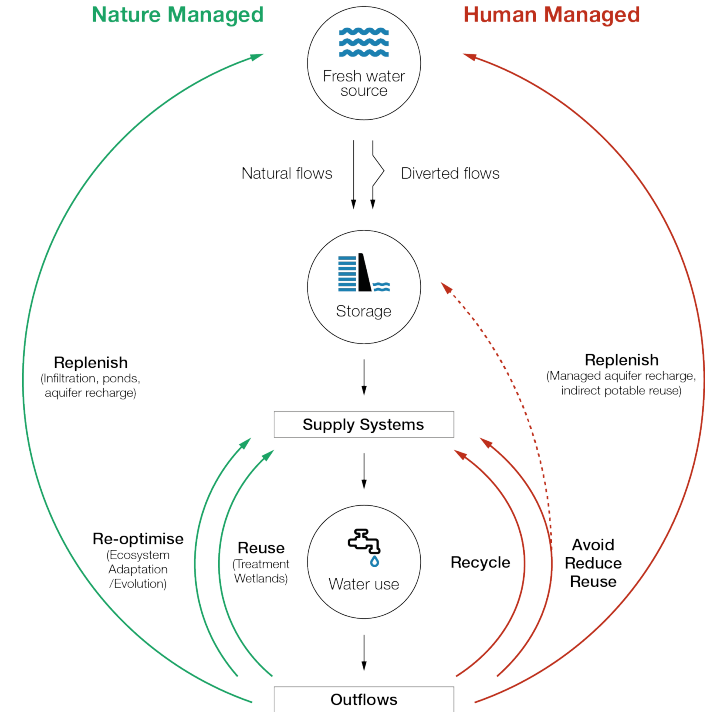
# The difference in Circular Economy (CE) thinking

## System Without CE thinking



Versus

## System With CE Thinking





# Opportunity

## ***Avoid Use***

Water is used as a service.

Through rethinking products and services it would be possible to eliminate ineffective uses.





# Opportunity

## ***Reduce Use***

Water is used as a service.

The amount of water use can be reduced through

- demand management,
- efficiency measures, and
- better resource allocation and management.





# Opportunity

## **Reuse**

Water is used as a resource or carrier

Pursue opportunities to reuse water or nutrients within an operation (closed loop) and for external applications within the surrounding vicinity or community.



Greywater for Landscape



# Opportunity

## **Recycle**

Water is used as service

Water recycling within  
internal operations  
and/or for external users.

For example, municipal  
recycled water





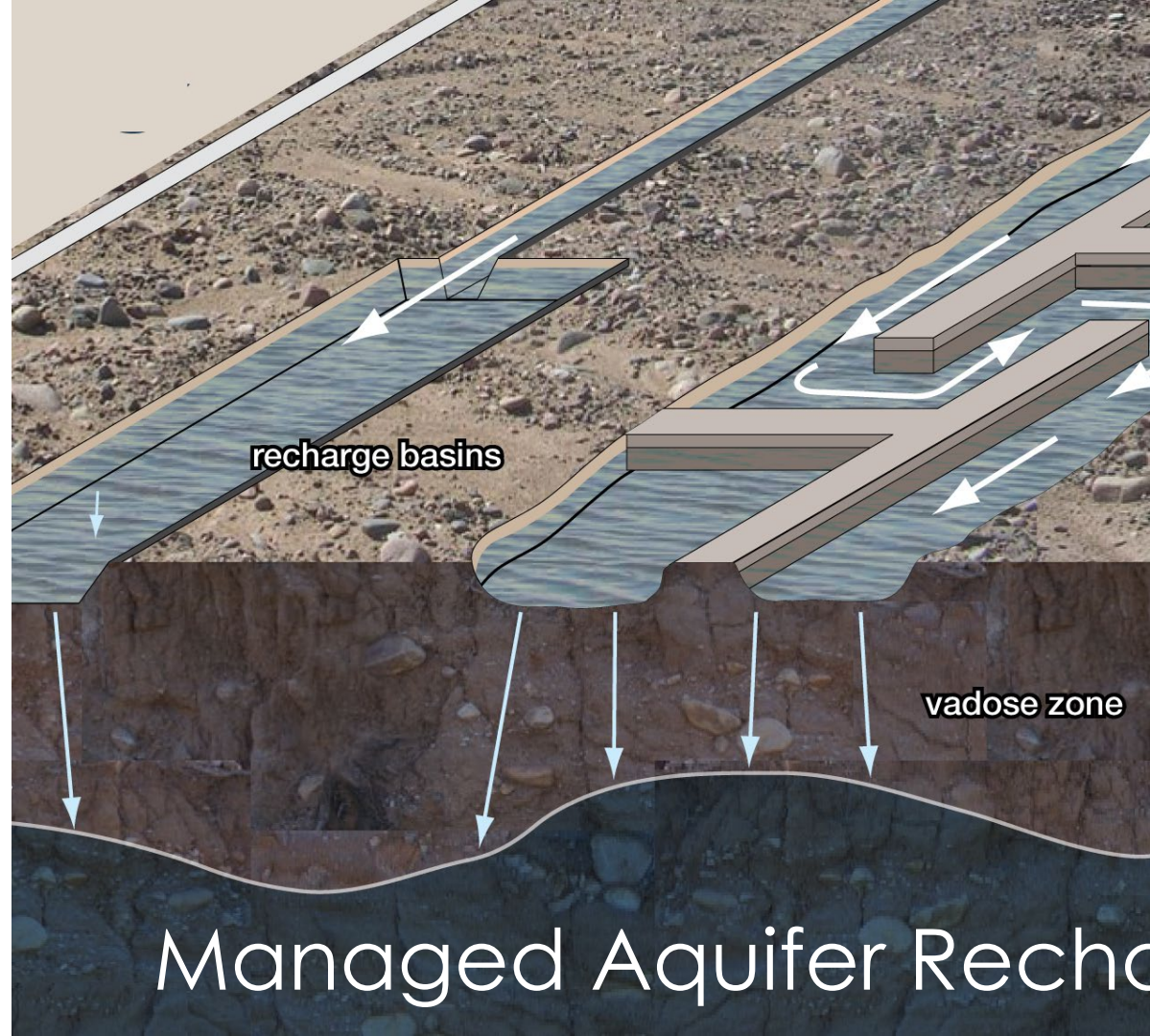
# Opportunity

## **Replenish**

Water as a service, to the environment and future users

Efficiently and effectively returning water to the basin.

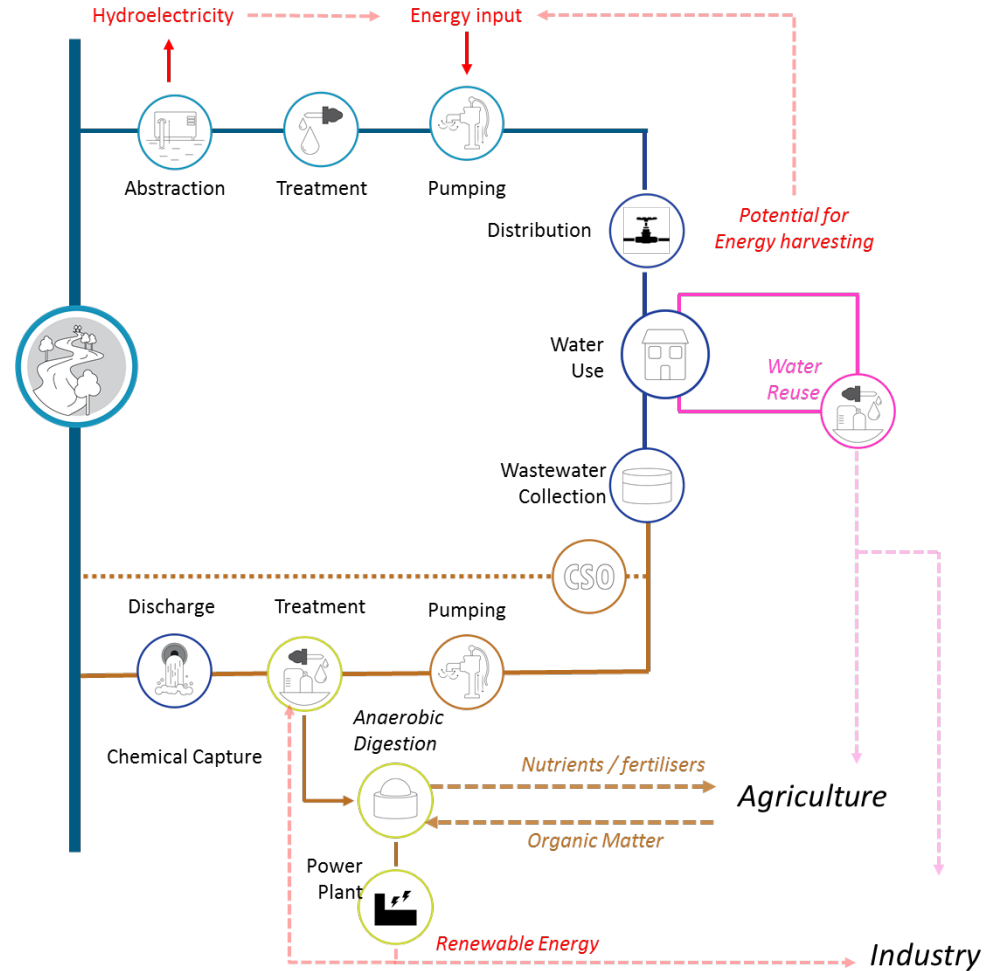
For example Managed Aquifer Recharge to replenish groundwater





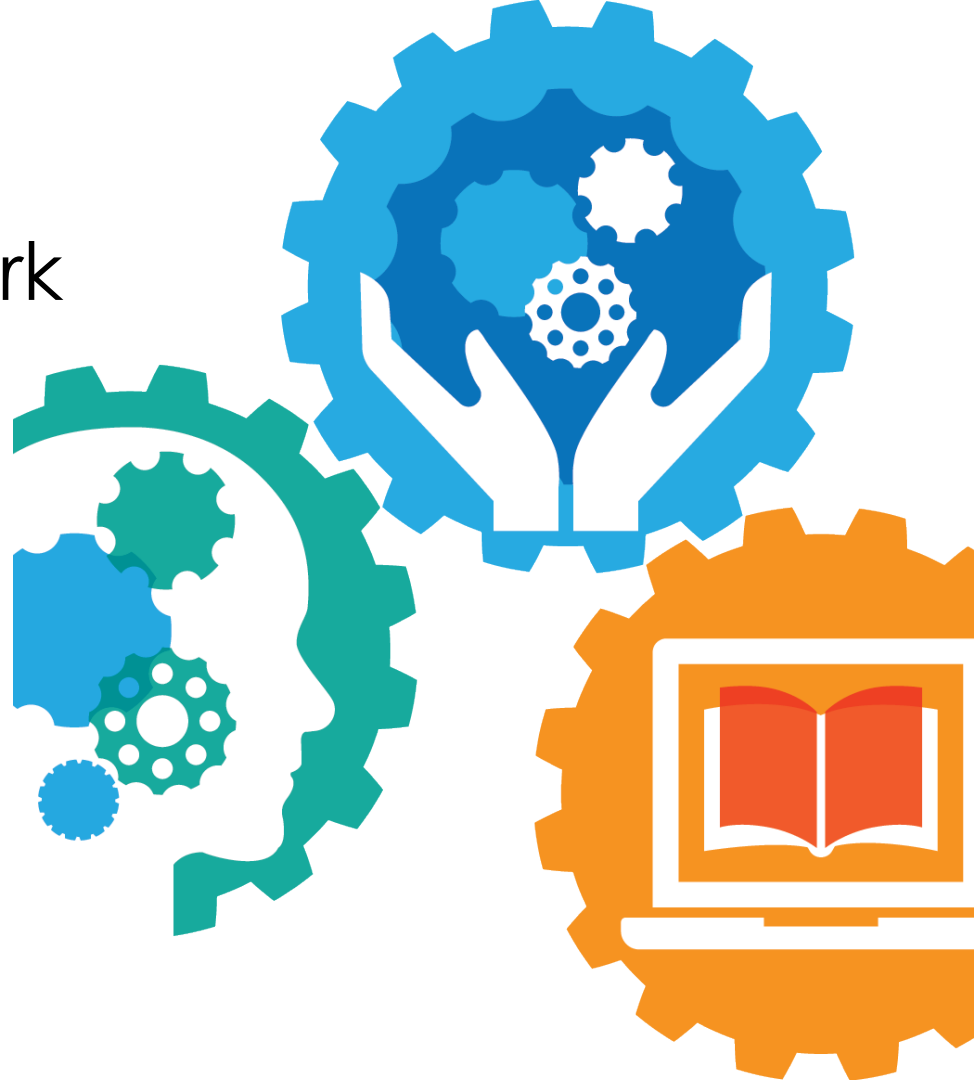
# Opportunity

Holistic view of  
multiple Circular  
Economy  
opportunities across  
a municipal water  
system



# Circular Economy Assessment Framework

- With Ellen MacArthur Foundation, AbInBev, Antea Group, Coca Cola, Danone, Dell, Google, Heineken, Hera Gruppo, Suez, and Veolia
- Scalable approach/ application
- Building, industrial estate, district, city, water utility, basin.
- Identify and evaluate opportunities





Thank you

© ARUP | Carol Lemmens | director | global Advisory Services leader  
10 March 2019 | CIWEM