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DESTINATION GREEN: THE NEXT CHAPTER



# International aviation and circular economy

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- Setting the scene
- A paradigm shift – changing the mindset
- Some successful examples
- Cooperation
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# Setting the scene

- The world is 9% circular\*
  - our global engine is stuck in reverse
  - the upward trend in resource extraction and greenhouse gas emissions has continued



\* Source: *Circularity Gap Report 2019*

*The Platform for Accelerating the Circular Economy (PACE)*



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We are  
heading in  
the wrong  
direction.





# The linear (traditional) approach



That linear model is no longer fit-for-purpose.





# Explore key topics

## Built Environment

Consumes almost **50%** of all global materials annually and **generates around 20%** of emissions

## Climate Breakdown

**62%** of global greenhouse gases are emitted during extraction, processing and production of goods

## Capital Equipment

High value machinery consumes **more than 50%** of all metals and accounts for **13%** of global value creation

## Metrics Matter

Materials, financial value and emissions are closely **interlinked** in the global economy

\* Source: *Circularity Gap Report 2019*

*The Platform for Accelerating the Circular Economy (PACE)*



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# A paradigm shift is necessary

“It's not just about shifting from coal-fired power stations to wind generators and solar panels.

It's not just about different forms of transportation.

It's about remanufacturing.

It's about redesign.

It's about regeneration.

It's the system that has to change.

It's complex.

It's exciting.”

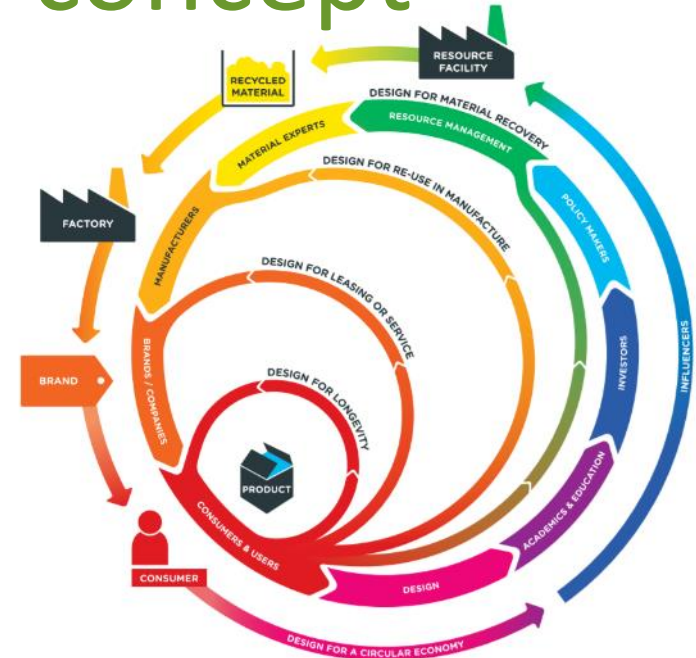


**Dame Ellen MacArthur**



# The circular economy concept

- Design to avoid resource use
- Design for longevity
- Design for service
- Design for reuse in manufacture
- Design for material recovery



Source: RSA (Royal Society for the encouragement of Arts, Manufactures and Commerce)





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- The circular economy is a new way of looking at the relationships between markets, customers and natural resources
- The circular economy is a \$4.5 trillion opportunity.

CEO GUIDE  
TO THE CIRCULAR  
ECONOMY



**ACCELERATE GROWTH**

- Gener8:** Create additional revenue from existing products and services
- Innov8:** Spur innovation of new products and services
- Moder8:** Reduce operating costs

**ENHANCE COMPETITIVENESS**

- Captiv8:** Enhance customer and employee relationships
- Differenti8:** Distinguish from competition
- Integr8:** Align corporate strategy with mission

**MITIGATE RISK**

- Acclim8:** Adapt business models and value chain relationships
- Insul8:** Mitigate linear risk exposure

**8 BUSINESS CASES FOR THE CIRCULAR ECONOMY**





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# Some successful examples





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- **Michelin Fleet Solution**
  - Created in 2001
  - For transport professionals
  - From tire sale to tire lease
    - Tire management delegated to Michelin (maintenance, replacement)
    - Charged on the basis of KM driven
    - Better truck availability plan
  - **Multiply tire life by 2.5**



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- **CorporateCare® and TotalCare® Services**
  - Tailored to individual operators' needs
    - latest predictive maintenance
    - asset and logistics management
    - repair and overhaul
  - Enables an airline to hand over full responsibility for management of the engine fleet at an agreed dollar rate per flying hour
    - remove uncertainties from engine management
    - provides airlines with greater financial confidence from managing predictable costs.
  - Based on “Power-by-the-Hour”, a Rolls-Royce trademark, was invented in 1962 to support the Viper engine on the de Havilland/Hawker Siddeley 125 business jet





# Circular economy is relevant for carbon

- Carbon (from captured CO<sub>2</sub>) as the new fuel – A real opportunity- CO<sub>2</sub> is
  - **Abundant** (even too much resource in the atmosphere): **unique**
    - The only energy source for which the reserves are increasing year after year...
  - **Equally shared** around the world if DAC is made possible: **unique**
    - Capture done as close as possible from the need for carbon to minimize transport
  - **Affordable if initial incentives**, R&D for cheaper technologies and market demand increase (cf. photovoltaic expansion)
    - In the United States the FUTURE Act was enacted reinvigorating section 45Q tax credits for investment in Carbon Capture Utilization and Storage (CCUS).
  - Carbon Capture has a cost
    - **Storage brings no value** (but creates negative emissions) – good for climate change
    - **Usage brings value – as CO<sub>2</sub> or as C** (carbon moves from a waste to a fuel) – better attractiveness
  - Recyclable indefinitely: chemistry helps
    - **A true circular economy of carbon**



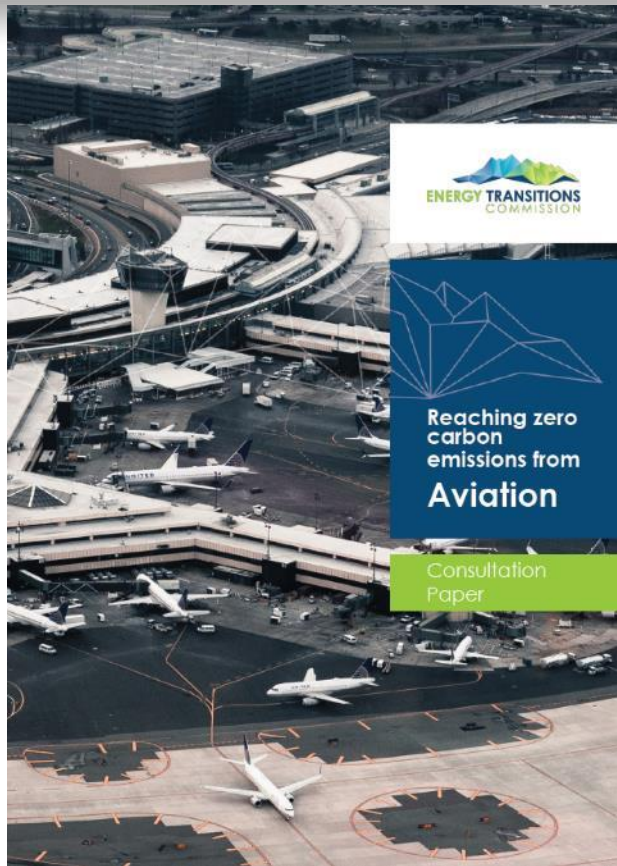
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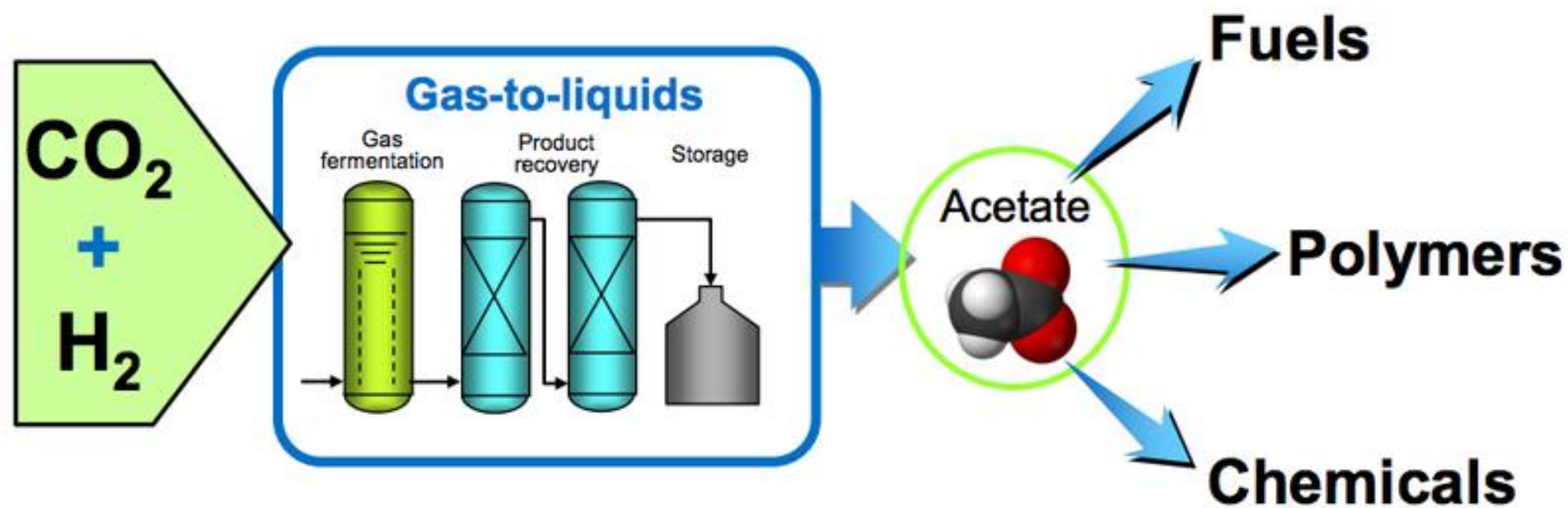
- **A global coalition of 30 leading executives from across the energy landscape**
  - energy companies, energy-intensive industries, investors, environmental NGOs and academics.
  - Identified **aviation as one of the “harder-to-abate” sectors**
  - it is almost certain that **the only route to radical decarbonization of long-haul aviation requires the development of a non-fossil-fuel-based liquid hydrocarbon.**
    - It is **technically possible** to produce the chemical equivalent of jet-fuel either from a bioenergy source, or via a “power-to-liquid” synthesis, combining CO<sub>2</sub> (extracted from the air or captured on the back of an industrial plant) with hydrogen.
    - **In theory, they could achieve a 100% decarbonization of air travel**, if they can be produced with net zero carbon emissions throughout their lifecycle.



**LanzaTech**  
capturing carbon, fueling growth.







*CO<sub>2</sub> uptake and capture demonstrated  
in a continuous fermentation*



# The need for a wider, broader cooperation

- Circular economy will not work if sectors work in silo and do not cooperate with each other
  - Some sectors need Carbon Capture to meet their commitments to the Paris agreement
    - 48% of CO<sub>2</sub> reduction from cement depend on CCUS
  - Some sectors need carbon for their activity
    - Who can decarbonate organic chemistry?
- A huge cooperation opportunity





## Conclusion: The NICE Platform

### Stakeholders that **emit CO<sub>2</sub>**

- Fixed industrial installations
- International transport (Shipping, aviation)

### Policy-makers, governments

- Recognize DAC as part of the solutions portfolio for Carbon Dioxide Removal (CDR)
- Incentivize CCUS solutions and finance R&D
- support lifecycle analyses and industrial standards
- **Request a minimum of permanent storage**

### Standard-making bodies

- Develop **appropriate new standards for CO<sub>2</sub> absorbing products**

## The New International Carbon Economy (NICE) Platform



### R&D Institutions

- Academia, Universities
  - Industrial Research Centres
- To improve knowledge on storage capacity  
To identify new CCU opportunities

### Stakeholders that **need carbon-based products**

- International aviation
- Chemistry

### Financial community

- Reduce investments on traditional fossil fuel sector if no CCUS activity

### OR

- **Maintain investments on traditional fossil fuels sector, for their CCUS activity**

### AND

- **Support the commercial development of mature solutions**

### All

- **Raise awareness** and build capacity
- Develop associated new jobs
- **Enhance acceptability** for CCUS

Governments, industry and financial institutions should **work together to scale up CCUS solutions**



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Get out of the **Galileo Galilei** syndrome...





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