

Introduction to Circular Economy

By ICAO Secretariat

CONCEPT OF CIRCULAR ECONOMY

Our current economic model relies on the traditional linear economy, which follows the pattern of creation, consumption and disposal of products. However, this linear economy is not sustainable. It leads to an increasing pressure on finite resources and generates significant waste and emissions. Instead, the concept of a “circular economy” was devised with the aim of minimizing waste and pollution and making the most of resources by keeping products and materials in use as much as possible, and by recovering and regenerating products and materials at the end of each service life.

The transition from linear economy to circular economy can put economic growth on a sustainable pathway, by reducing finite resources consumption and minimizing waste and environmental impacts. According to the Ellen MacArthur Foundation¹, the implementation of circular economy is guided by three principles:

1. Waste equals Food – Redefining the purpose of end-of-life products can extend their durability and reduce the environmental impacts of manufacturing new products. Within a closed loop, appropriate maintenance, reuse, refurbishment and recycling can extend the life cycle of products. These products are no longer to be considered as waste, but as essential inputs to manufacturers and service providers (see Figure 1);
2. Use renewable resources – By increasing the utilization of renewable or waste-derived resource and energy, circular economy model could create new types of jobs and reduce environmental impacts, including carbon emissions.

3. Build resilience through diversity – In order to achieve the reduction of virgin material consumption and waste generation, supply chains need to be developed to reorient products from one manufacturing process into another. Therefore, designing a circular economy model requires bringing together various companies and stakeholders, which serve different functions within a circular economy system.

Currently, the concept of circular economy has been integrated through many national and organizational policies. For example, it was acknowledged as one of China’s national development strategies throughout the country’s 12th Five-Year Plan (2011-2015) and its Circular Economy Promotion Law of 2009. In 2015, the European Commission launched its own Action Plan for the Circular Economy programme, which sets out a policy framework with measures and targets on waste management. The concept of circular economy is also an integral part of the following United Nations’ Sustainable Development Goals:



1 Franconi, E., 2016. A New Dynamic 2: Effective Systems in a Circular Economy. Ellen MacArthur Foundation Publishing



Since 2015, Air France-KLM Group adopted circular economy strategy in their flight operations. The strategy entails four components of the circular economy as follows:

- Redesign: Redesigning the catering services to separate the waste correctly;
- Reduce: Reducing the mass of food packaging and switching manuals from hard copy to digital;
- Reuse: Reusing the seats and on-board entertainment systems in other systems; and
- Recycle: Recycling the reusable equipment, including trays, drawers, blankets and trolleys, etc.

To handle end-of-life aircraft, Boeing and Airbus have developed their individual management approaches. Airbus launched the PAMELA project (Process for Advanced Management of End-of-Life Aircraft), which includes three stages: decommissioning, disassembly, and smart and selective dismantling. It demonstrated that 85 per cent of an Airbus A300 aircraft weight can be recycled, reused or recovered as secondary raw materials. On the other side, Boeing co-founded the industry association AFRA (Aircraft Fleet Recycling Association), which aims to set-up a new standard for an environmentally responsible management of end-of-life aircraft.

At airports, the application of circular economy has also demonstrated great potential for environmental and economic benefits. Schiphol Airport and Philips developed a partnership and provided a circular lighting solution for airport. In this light service solution, Philips remains the owner of the lamps and fittings. It is possible to replace separate components with ease, thus extending the service life of the lighting fixtures. When lamps reach the end of their service life, Philips will collect and recycle them. This circular solution not only reduces 50 per cent energy consumption by energy-efficient LED lighting and

extends 75 per cent service life of the fittings, but also reduces maintenance costs and raw material consumption. The environmental and economic benefit of circular economy has also been demonstrated by redesigned waste management system in Gatwick airport. Through efficient waste collection, sorting and on site utilization, Gatwick reduces £750,000 operation cost per year from saving of onsite energy and water, reduced offsite processing and disposal, and income from increased recycling (from 52 per cent in 2016 to 70 per cent in 2019). In 2018, Gatwick became the first airport to achieve the Carbon Trust's Zero to Landfill certification (more information is provided later in this chapter).

THE WAY FORWARD

Although there are great potential and demonstrated benefits of circular economy applications in aviation, the implementation of a circular economy model remains limited. Many stakeholders have not yet identified the potential scale of aviation-associated waste. Additionally, some stakeholders may not have access to the best available circular economy technologies and applications. Partnerships and assistance programmes could be developed to evaluate the feasibility of circular economy at local level and provide technical, financial and political support to the States that need it the most.

In the spirit of *No Country Left Behind* initiative, ICAO has been raising awareness on circular economy applications through the organization of a Seminar on Green Airports from 8 to 9 May 2019 in Lima, Peru, and the 2019 Environmental Symposium “*Destination Green: the Next Chapter*” from 14 to 16 May 2019 in Montreal, Canada. Both events featured presentations on the possible applications of circular economy models to the aviation

sector. Capacity-building activities also entail making sure that guidance is made available, which ICAO has been doing through the Eco-Airport Toolkit e-publication on Waste Management at Airports². The objective is to provide practical and ready-to-use information that is accessible to support the environmentally sustainable planning and implementation of airport infrastructure projects. The publication dedicated to waste management defines three different steps: 1) analysis of material

flows; 2) identification of areas for improvements; and 3) implementation of circular business models. Based on this, a global platform could be developed to share the most advanced technologies and applications of circular economy in global aviation. It could give rise to relevant partnerships with experts in the field of aircraft recycling and dismantling, and waste management in airport, along with the one formed between ICAO and the Aircraft Fleet Recycling Association (AFRA).

ADDITIONAL REFERENCES

1. Boulding, Kenneth E. (March 8, 1966). "The Economics of the Coming Spaceship Earth" (PDF). In H. Jarrett (ed.)
2. Mathews, J.A. and Tan, H., 2016. Circular economy: lessons from China. *Nature News*, 531(7595), p.440.
3. Grann, H., 1997. The industrial symbiosis at Kalundborg, Denmark. *The industrial green game. Implications for environmental design and management*, pp.117-123.

2 <https://www.icao.int/environmental-protection/Pages/Ecoairports.aspx>