

# CICCULAT CMEWEBINARS SERIES#3 COCODONNY



**ENVIRONMENTAL IMPACTS** DUE TO LINEAR PRACTICES IN **HEALTHCARE** 

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The healthcare industry is among the most carbon-intensive service sectors<sup>1</sup>. It is responsible for 4.4–4.6% of worldwide greenhouse gas emissions and about the same proportion of air pollutants<sup>2</sup>. These emissions arise directly from health care facilities, as well as indirectly from the supply chain of healthcare goods and services. During the past 30 years the health care industry has become increasingly reliant on single-use (disposable) medical devices, particularly in high-income countries<sup>3</sup>. Of the total amount of waste generated by healthcare activities, about 85% is general, non-hazardous waste, while the remaining 15% is hazardous material that may be infectious, chemical or radioactive<sup>4</sup>. Most of this waste (both hazardous and non-hazardous) is not separated nor recycled, but rather incinerated or landfilled. This leads to a waste of resources, pollution (of air, soil and water) and costs, exacerbating resource depletion, biodiversity loss, climate change, and eventually also impacting human health<sup>5,6</sup>.



"A linear economy leads to ecological destruction by depleting natural resources, generating (unrecyclable) waste, pollution and GHGs"

# **CIRCULAR ECONOMY** IN THE HEALTHCARE SECTOR

A Circular Economy is a new paradigm to achieve sustainable production and consumption and preserve natural resources. In contrast to a linear economy (take-make-waste), a circular economy is regenerative by intention, by closing cycles just like in nature. A circular economy is achieved through innovative business models that avoid excessive resource use, design out waste and pollution, while maintaining and creating value for society and the environment. Meanwhile, the use of toxic chemicals and fossil fuels are also eliminated. Thus, a Circular Economy goes beyond efficiency, but achieves eco-effectiveness through systems thinking. "A CE is a regenerative system in which the use of natural resources is minimized, waste and pollution are prevented through innovative business models"



"the circular economy is key to achieve sustainable development"

# MAIN CIRCULAR PRINCIPLES

### a circular economy revolves around the following five principles:

- 1. Minimise resource use and extraction (narrow flows)
- 2. Use resources longer, extend product life (slow flows)
- 3. Optimal resource recovery through high-quality recycling (close flows)
- 4. Ecosystem stewardship (prevent pollution and regenerate ecosystems)
- 5. Create economic and social value equitably



#### From Bocken's framework of Flow strategies that guides designers and business strategies in the move from a linear to a circular economy.

Source: Bäunker, Lena, "Circular consumption in the linear economy: only a drop in the ocean?" https://www.circle-economy.com/blogs/circular-consumption--in-the-linear-economy-only-a-drop-in-the-ocean October 14, 2020

# Circular Strategies that reduce resource use and maintain value:

| Smarter<br>product<br>use and<br>manufacture       | R0 Refuse        | Make a product redundant: abandon function or use different product           |
|--|------------------|---|
|  | R1 Rethink       | Make a product use more intensive: sharing or multi-functional products       |
|  | R2 Reduce        | Consume less through efficient<br>manufacturing or use                        |
| Extend<br>lifespan of<br>products and<br>its parts | R3 Re-use        | Re-use of functioning discarted products by another use                       |
|  | R4 Repair        | Repair and maintenance of defects to<br>keep original function                |
|  | R5 Refurbish     | Restore and update  |
|  | R6 Remanufacture | Use parts in a new product with same function                                 |
|  | R7 Repurpose     | Use products or parts in a new product with a different function              |
| Useful<br>application<br>of materials              | R8 Recycle       | Process material to obtain the same (high grade) or lower (low grade) quality |
|  | R9 Recover       | Incineration of material with energy recovery                                 |

Source: Potting , José et al., "Circular economy: measuring innovation in the product chain", https://www.pbl.nl/ sites/default/files/downloads/pbl-2016-circular-economy-measuring-innovation-in-product-chains-2544.pdf, January 2017

# **CIRCULAR STRATEGIES**

When implementing these strategies, the focus should always be on upstream solutions, rethinking and redesigning product-service systems so to extend product lifespan and maintain value of components and materials for as long as possible. This also requires new business models (performance-based) and collaboration throughout the supply chain. Philips<sup>8</sup> for instance provides trade-in schemes for medical equipment (e.g. MRI systems, patient monitors and ventilators) to be refurbished. In the end, this should lead to zero waste to landfill or incineration.

"In a circular economy, emphasis is on upstream design solutions that extend product lifetime (design for reuse, repair, remanufacturing) and enable high-quality recycling"\_\_\_\_\_



# *Circular Design: designing out waste and pollution*

"Reuse" is key in a circular economy. Currently, the healthcare sector uses significant amounts of single-use plastic packaging and (protective) materials, such as disposable clothing, gloves etc. Most of these could be substituted by reusable items, as long as an efficient system is established to take back, process and sanitise after use. More information: Plasticsfree Healthcare<sup>9</sup>.



# Medical Devices reprocessing



Source: Healthcare Without Harm, "On the road to circular healthcare - reusing medical devices" https://noharm-europe.org/articles/news/europe/road-circular-healthcare-reusing-medical-devices, March 25, 2021

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Reprocessing enables circular practices in the healthcare sector

A specifically important strategy for the healthcare sector is "reprocessing", which refers to a process carried out on a used device in order to allow its safe reuse. It includes its cleaning, disinfection, sterilisation and related procedures, as well as testing and restoring the technical and functional safety of the used device<sup>10</sup>.

There are various types of medical devices, which have different potential for reprocessing and reuse. Low-complexity devices that are difficult to clean (e.g. intravenous catheters, tubing, syringes, and needles) pose practical challenges for reuse. High-complexity devices on the other hand, such as medical imaging equipment, are usually designed for long lifespans and maintained with cycles of maintenance, repair, and refurbishment. In between are devices for which circular design coupled with reprocessing protocols offers the possibility of maintaining product integrity<sup>11</sup>. The more complex the device, the higher the economic and environmental savings of maintaining product integrity. Design strategies for circular medical products<sup>12</sup> are still under development, but have a lot of potential to transform the sector.

# **CIRCULAR MEASURES** FOR HEALTHCARE INSTITUTIONS

There is a wide array of practical measures that healthcare institutions can take in order to apply circular strategies in practice, whether during the construction of buildings or the operational management on a daily basis. Many circular and sustainable measures, e.g. energy and water--saving, reducing food waste and improving recycling, are not only better for the environment but also help save costs. Furthermore, public institutions have the responsibility to apply strict sustainability criteria in their procurement processes (e.g. for medical devices, protective clothing and other materials), which should also integrate circular criteria (e.g. circular design free from harmful substances). Healthcare institutions can also improve the direct surroundings by creating healthy, green spaces (e.g. green rooftops, vertical gardens). "The healthcare sector has to reduce its ecological footprint by using less disposables and using more reusable medical devices"

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"The Circular Economy is an opportunity to save costs."

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nat reprocessed single-use medical devices in 2019.

ce: AMDR, "Reprocessing by the numbers",2019 Annual Survey AMDR, ers\_FINAL\_web.pdf?utm\_source=newsroom&utm\_medium=article&utm\_campaign=renewalearthday&utm\_term=&utm\_content=4222021



# HEALTH BENEFITS FROM A CIRCULAR ECONOMY

A recent report by the World Health Organisation<sup>13</sup> analyses the implications of a circular economy for human health. In general, many positive health impacts are expected from reducing the use of primary resources, maintaining the highest value of materials and products and shifting towards renewable energy. Particularly (in)direct benefits will arise from improved resource-efficiency and reduced environmental impacts by manufacturing processes (e.g. improved air, soil and water quality, less GHG). However, negative health impacts are still a reality due to substances of concern in products (e.g. bisphenol A and brominated flame retardants in electronic equipment). Therefore, these have to be phased out by policies and regulations, stimulating manufacturers to adopt circular design practices without harmful substances.





Linear practices in the healthcare sector lead to significant waste production, greenhouse gases and other forms of pollution. There is a lot of potential to reduce the ecological footprint of healthcare institutions, which starts by eliminating single-use materials and disposable medical devices. By switching to reusable medical devices instead, the healthcare sector can reduce costs and be part of the transition to a circular economy.

In a linear economy, the overexploitation and use of (natural) resources lead to significant environmental harm.



The healthcare sector also has a significant ecological footprint and generates a lot of waste, largely due to the widespread use of single-use disposables (materials and devices).

A CE is a regenerative system in which the use of natural resources is minimized, and waste and pollution are prevented, through innovative business models and sustainable modes of production and consumption.

In a circular economy, emphasis is on **upstream design solutions that extend product lifetime** (design for reuse, repair, remanufacturing) and enable high-quality recycling, while regenerating ecosystems.

The healthcare sector can reduce its ecological footprint by using fewer disposables and adopting circular practices. These contribute to sustainable development, create socio-economic opportunities, improve public health and cut costs at the same time.

1 Pichler PP, Jaccard IS, Weisz U, Weisz U, Weisz H. International comparison of health care carbon footprints. Environ Res Lett. 2019;14(6):064004. Crossref, Google Scholar. 2 Health Care Without Harm. Health care's climate footprint: how the health sector contributes to the global climate crisis and opportunities for action [Internet]. Reston (VA): Health Care Without Harm; 2019. 3 MacNeill et al., "Transforming The Medical Device Industry: Road Map To A Circular Economy" https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01118, December 2020. 4 WHO, "Health-care waste", https://www.who.int/news--room/fact-sheets/detail/health-care-waste,8 February 2018. 5 Eckelman et al. (2020) "Health Care Pollution And Public Health Damage In The United States: An Update" Health Affairs Vol. 39, No. 12: Climate & Health. 6 The growth in medical waste may even pose a threat to public health (Pitt; Kovach, Lindenberg, 2021). 7 Ellen Macarthur Foundation, https://ellenmacarthurfoundation.org/publications, 2013. 8 Philips, "Philips Circular Edition systems", retrieved 23/May/2022, https://noharm-europe.org/issues/europe/towards-plastic-free-healthcare-europe. 10 European.

"Towards plastic-free healthcare in Europe", retrieved 23/May/2022, https://noharm-europe.org/issues/europe/towards-plastic-free-healthcare-europe 10 European Commission, retrived 23/May/2022, "Reprocessing of medical devices", https://ec.europa.eu/health/medical-devices-topics-interest/reprocessing-medical-devices\_en 11 MacNeill et al., "Transforming The Medical Device Industry: Road Map To A Circular Economy" https://www.healthaff.airs.org/doi/10.1377/hlthaff.2020.0118, December 2020 12 Kane, G.M. et al., "Towards design strategies for circular medical products" https://www.sciencedirect.com/science/article/pii/S0921344917302094, August 2018 13 WHO, "Circular economy and health: opportunities and risks (2018)", retrieved 23/May/2022, https://www.euro.who.int/en/publications/abstracts/circular-economy-and-health-opportunities-and-risks-2018.



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