

HEALTHCARE, CIRCULAR ECONOMY PRINCIPLES AND SUSTAINABLE WELLBEING

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INTRODUCTION AND CONTEXT

The provision of healthcare plays a part in the challenge our global economy poses to planetary boundaries, placing a significant demand on natural resources and making a major contribution to climate change. This is both directly, through the operation of healthcare facilities, and indirectly, through the products the system procures, uses and disposes ⁽¹⁾.

Inefficiencies in healthcare systems lead to avoidable resource consumptions and to poor health outcomes. As an example, research suggests that at least 30–50% of prescribed medication is not taken as recommended because of poor adherence, potentially resulting increased patient morbidity or mortality, as well as to wasted expenditure and unnecessary environmental impact ⁽²⁾.

In the UK, it is estimated that at least 10kg ⁽³⁾ of hospital waste is produced per capita per annum. This is not only a significant waste management issue, but also represents lost resources, as the majority is disposed by incineration and a proportion of the waste is unused products.

Global expenditure on healthcare represented close to 10% of GDP in 2015 ⁽⁴⁾, a proportion that is anticipated to grow because of increased access to healthcare and as a consequence of an ageing global population and the higher demand placed on healthcare services as we age ⁽⁵⁾. The number of people aged 60+ is expected to double globally by 2050 and more than triple by 2100. By 2050, there will

(1) Brown, Lawrence H., Petra G. Buettner, and Deon V. Canyon. "The Energy Burden and Environmental Impact of Health Services." *American Journal of Public Health* 102.12 (2012): e76–e82. PMC. Web. 17 July 2018.

(2) Medicines concordance FINAL scope (NICE April 2007)

(3) 590,000 tonnes of waste (NHS SDU, 2018). 55,619,430 population of England (ONS, 2017)

(4) Xu K., Soucat A., Kutzin J., et al. *New Perspectives on Global Health Spending for Universal Health Coverage*. Geneva: World Health Organization; 2018 (WHO/HIS/HGF/HFWorkingPaper/18.2). Licence: CC BY-NC-SA 3.0 IGO.

(5) Office for Budgetary Responsibility (September 2016). *Fiscal sustainability and public spending on health*. Chart 2.3

be an estimated 2.1 billion people over the age of 60 (962 million in 2017) ⁽¹⁾.

Paradoxically, a growing healthcare sector and the associated increase in resource consumption, pollution and climate change contribution will itself lead to poor health. Currently, healthcare is estimated to contribute 3-5% of global greenhouse gas (GHG) emissions, whilst the World Health Organisation identifies climate change as the most important threat to global health.

Healthcare inter-links with all parts of the economy, imposing a high demand on, *inter alia*: infrastructure; transport; the production of medicines and medical devices; education establishments; communication systems; clean water; and waste management. Each of these linkages commands the consumption of natural resources and results in emissions to air, land and water, impacts multiplied because of the need for safe sterile environments, for HVAC, pure water supplies, packaging for medicines, high purity feedstocks, gases and solvents and the ultra-clean production facilities required for drug manufacture.

Ultimately, healthcare systems are pulled in two directions. They face the challenge of dealing with increased demand, including the effects of climate change, whilst at the same time responding to the imperative of addressing an unsustainable use of resources and emissions of greenhouse gases. The need for change is manifest.

THE CIRCULAR ECONOMY

More generally, that society's consumption of resources is not sustainable has long been recognised. A linear 'take, make and dispose' economy that depletes finite resources will ultimately exhaust them, and so it becomes essential to deliver the functions of the economy which society demands with progressively reduced resource consumption. ⁽²⁾

In the last few years, the circular economy concept has attracted considerable attention, including the work commissioned of the Ellen MacArthur Foundation ⁽³⁾ and the European Commission's Circular

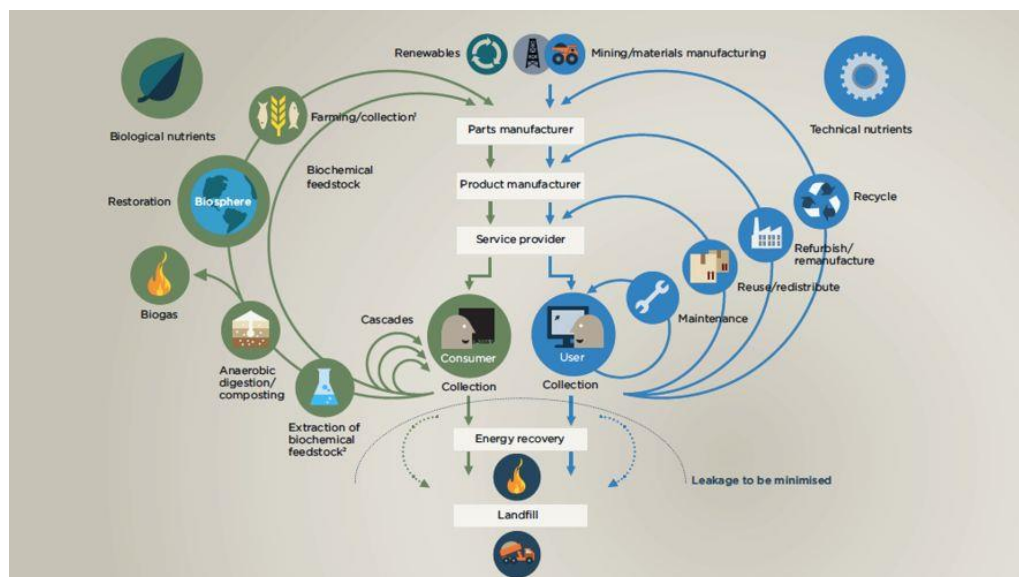
(1) United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP/248.

(2) Nonetheless, one should be cognisant of previous forecasts of limits to growth that were understandably unable to account for human ingenuity and technological development.

(3) Towards the Circular Economy: Economic and business rationale for an accelerated transition. Ellen MacArthur Foundation. 2013

Economy Package ⁽¹⁾, as well as the development of a standard for implementing the principles of the circular economy within organizations (BS 8001: 2017). These, and other actors and commentators, recognise the value that accrues from increasing the frequency and throughput of feedback loops, retaining energy and materials in the economy. This is illustrated in the Ellen MacArthur Foundation's butterfly diagram, shown below.

An increasing number of examples show where healthcare organisations are seeking to develop circular product solutions. For example, reusable cold chain boxes have been developed for the transport of medicines and the Healthcare Plastics Recycling Council (HWRC) addresses a specific issue. The European Trade Association representing the medical imaging, radiotherapy, health ICT and electromedical industries (COCIR) has undertaken pilot studies evaluating the feasibility of measuring the circularity of the medical imaging business model in the EU. COCIR's Circularity Index (C.I) is defined as tonnes of reused equipment divided by tonnes of sold equipment, where a perfect circular economy results in a C.I of 1. Globally, COCIR companies collect and repair/refurbish around 6400 tonnes of parts per year ⁽²⁾.



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However, it is important to be clear that society's objective should not be circularity for its own sake. Rather, it should be for its use as a vector for delivering progress against other ambitions, as functions of societal value are delivered. Such ambitions would include

(1) 2018 Circular economy package. European Commission. http://ec.europa.eu/environment/circular-economy/index_en.htm

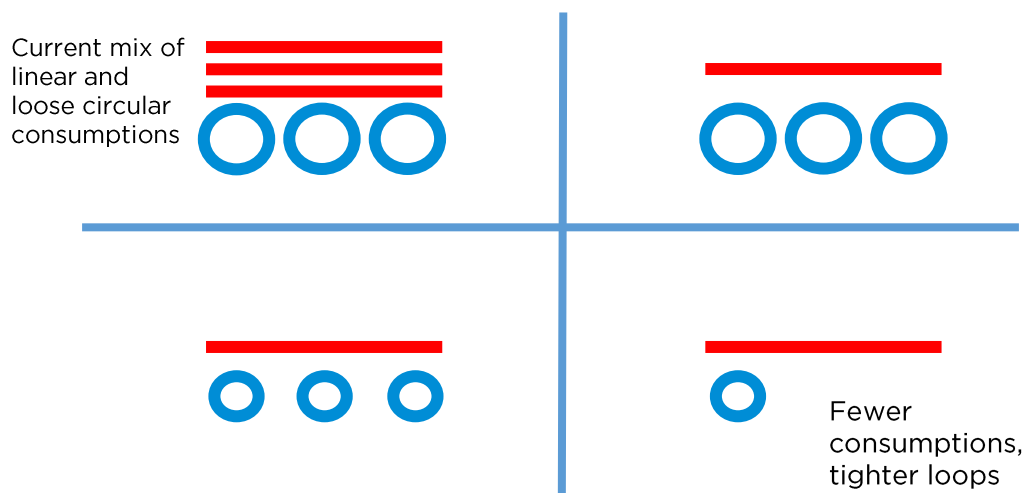
(2) COCIR self-regulatory initiative for the ecodesign of medical imaging equipment status report 2016 - September 2017.

reductions in non-renewable and renewable resource depletion and reductions in greenhouse gas emissions.

Indeed, it is important to ensure that the activities needed to close the materials loop are not themselves so burdensome that the outcome is counter-productive, risking safety or increasing the burden on the environment and natural resources. As a simple example, transport of glass for reuse or recycling over a very long distance will consume significant quantities of fuel in order to substitute cullet for what is, more or less, a ubiquitous resource. In such a case, this 'friction' might result in a linear model for the function provided by glass being preferred to a circular one.

Ideally, the functions required by society should be delivered in the most efficient way possible, where the numerator of efficiency relates to the ambitions referred to above. Such efficiency doesn't necessarily demand that all linear models are made circular, although it does require that there are fewer of them. Generally, it will also require there to be fewer loops, and that these loops are tighter, since the loops themselves are impactful.

This is illustrated schematically below, where the aim should be to progress from an unsustainable mix of linear and circular models in the top left, not simply to less linear models, or less of these and tighter loops, but to fewer both, and where the loops are tighter, shown in the bottom right of the diagram.



NEW BUSINESS MODELS

The Ellen MacArthur Foundation's concept of the circular economy identifies the potential benefits offered by innovative business models. In these, deliberate design allows products and materials to be kept in use for as long as possible in order to maximise efficiency. In such instances, the business model is re-imagined specifically to improve efficiency in the delivery of a function, rather than necessarily a linear system being closed in a loop. Car sharing groups and AirBnB are frequently quoted as examples of such new business models.

APPLYING CIRCULARITY PRINCIPLES IN HEALTHCARE

In some instances, healthcare relies on a linear model, for example advocating:

“catch it, bin it, kill it”

Flu campaign by UK Department of Health and Social Care, 2012

“Discard gloves after each task and clean your hands – gloves may carry germs.”

Hand hygiene: why, how & when? WHO, 2009,

Although dependent on single use products, there are many instances where one can envisage the ready application of the principal loops in the butterfly diagram, such as the re-use of anaesthetic gases; the refurbishment or remanufacture of scanning equipment or surgical instruments; or the reuse/recycling of packaging. EFPIA also details specific examples from its members of conventional material efficiency measures (reduce, reuse, recycle, recover) applied to the infrastructure, medicines and medical devices required to treat conditions in its white paper on the circular economy ⁽¹⁾.

However, at the core of the circular economy model, where the terms employed are the *service provider*, the *user* and *maintenance*, the logic becomes less easy to articulate for healthcare because the 'products' of concern for the sector are the individual and society as a whole. Following this logic, the function in demand is wellbeing, and efficiency is achieved by extending lifetimes and maximising wellbeing, at least environmental cost.

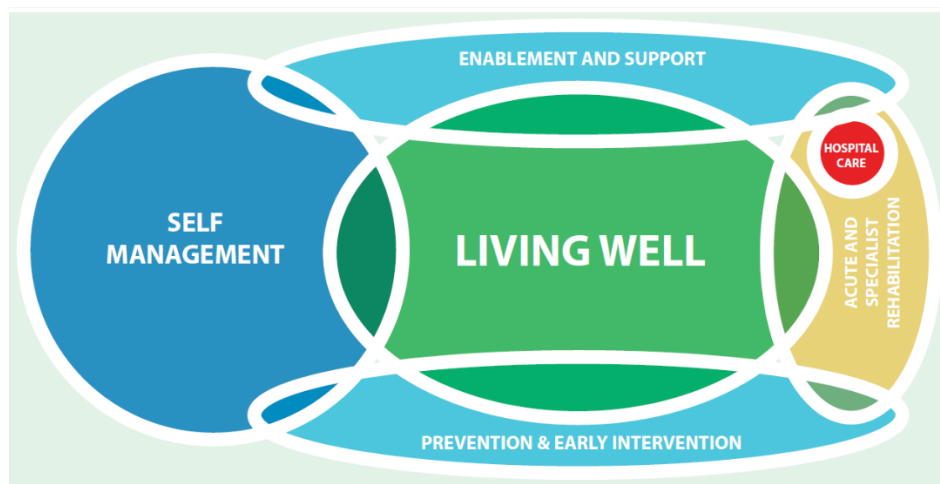
(1) EFPIA White Paper on Circular Economy. October 2016.

AN INNOVATIVE BUSINESS MODEL FOR HEALTHCARE

This implies that the innovative business model for the healthcare sector should be one that focuses on the function of lifetime wellbeing of the individual or the population, and the resources required and emissions incurred in delivering that function:

Healthcare Resources & Emissions/Lifetime wellbeing

To increase wellbeing most efficiently, 'maintenance' activity on the individual might most especially be preventative. Earlier and more transformative interventions can be most effective and deliver the lowest overall intensity per unit of wellbeing over the long term, despite a rise in the consumptions and emissions of healthcare in the short term.



Source: *Sustainable, Resilient, Healthy People & Places*

Module: *Sustainable clinical and care models, The Sustainable Development Unit, 2014*

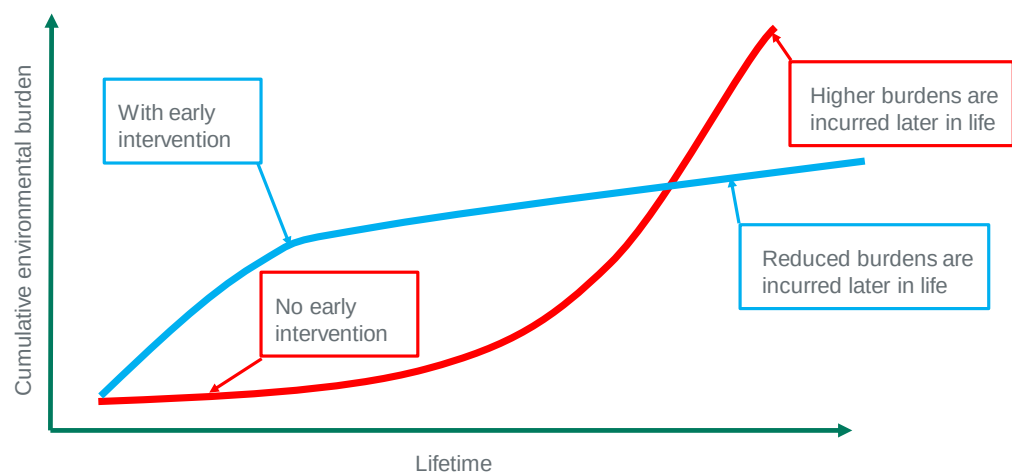
Early interventions, and supporting people to manage their lives in a positive way, can reduce the need for acute treatment and hospital care and prevent or mitigate patients developing conditions later in life. As an example, education as to better lifestyle choices can reduce the incidence of diabetes. A study in the United States showed that for every seven people treated with a three year lifestyle intervention programme (an initial 14 lesson curriculum and regular review consultations), one case of diabetes could be avoided ⁽¹⁾.

Although resource consumptions are required in order to deliver such an education programme, cumulative environmental impacts would be higher without the education intervention, due to the prolonged treatment of morbidity with consultations, medicines and potentially

(1) Knowler, WC, Barrett-Connor, E, Fowler, SE. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med.* 2002;346(6):393-403.

surgical treatment and in-patient care, as well as travel associated with treatment. Not only that, but greater wellbeing is delivered, multiplying the impact on the efficiency metric.

The diagram below shows schematically what the balance of environmental burden might be with, and without, the early intervention. In this instance, the model clearly indicates what action should be taken to deliver lifetime wellbeing most efficiently in environmental terms.



In a recent study, the cumulative lifetime burden for the treatment of type 2 diabetes was estimated to be 1740 kg CO₂e ⁽¹⁾. This is equivalent to burning 540 kg of oil, or the same impact as a patient attending 600 diabetes management training sessions ⁽²⁾. This far outweighs the investment in the programme described above that was shown necessary to avoid a case of diabetes (irrespective of the wellbeing benefits that accrue).

This approach is entirely consistent with the statement in the NHS' Five Year Forward View, which puts the calculus a different way around, viz. *"if the nation fails to get serious about prevention then recent progress in healthy life expectancies will stall, health inequalities will widen, and our ability to fund beneficial new treatments will be crowded-out by the need to spend billions of pounds on wholly avoidable illness ⁽³⁾."* Not only will wellbeing suffer, but there will also be an additional cost in terms of the environmental consequences of avoidable expenditure.

(1) Lifelong Type 2 Diabetes Management Care Pathway Case Study www.shcoalition.org/

(2) Estimated with reference to 'Care Pathways: Guidance on Appraising Sustainability: Condition Self-Management Module & Patient Travel Module www.shcoalition.org/

(3) Five year forward view. NHS. October 2014.

Applying such life-time environmental accounting approaches in a wellbeing model, the healthcare sector can help deliver the goals of the circular economy whilst not compromising its primary aim, increasing the wellbeing of individuals and populations.

ABOUT THE AUTHORS

The Sustainable Healthcare Coalition is a partnership of healthcare companies and other health agencies drawn together to address some of the most pressing sustainability issues in global healthcare. We are an open-minded collaboration across public and private healthcare working to facilitate the journey towards good health and wellbeing on a finite planet. Focusing on key obstacles, the partnership shares data and insights, and develops best-practice guidance for use in healthcare systems and their supply chain partners.

Simon Aumônier and Michael Collins, Environmental Resources Management (ERM). Environmental Resources Management (ERM) is a member of the Sustainable Healthcare Coalition and is a leading global provider of environmental, health, safety, risk, social consulting services and sustainability related services. It has more than 160 offices in over 40 countries and territories employing more than 4,700 people who work on projects around the world.

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