ACTIVITY

# 05

## NANO MEMBRANE TOILET - THROUGH FOUR LENSES OF CIRCULAR DESIGN

WHAT ARE THE DIMENSIONS OF CIRCULAR DESIGN?

### CONTEXT FOR THE ACTIVITY

This activity provides a reference point to circular design by putting into context the overarching dimensions of design thinking and circular economy needed to create a new mind set for design. It is based on understanding four lenses of circular design:

**Lens 1** – Think about compatible nutrients and their flows
**Lens 2** – Shape creatively to meet needs
**Lens 3** – Embed digital intelligence
**Lens 4** – Design with context in mind

A ‘lab story’ from Cranfield University is used to prompt discussion on how we can re-think great inventions such as the toilet. The key context for this activity is Cranfield University’s Nano Membrane Toilet which will be able to treat human waste on-site without external energy or water. Great inventions have changed people’s lives, yet they are not accessible to all. For example, 2.4 billion people globally still lack proper sanitation facilities. So, there is a huge opportunity to create new mindsets for design to reinvent current structures and create regenerative systems that are accessible to all.

## RESOURCES AVAILABLE

- 5:R1a Intro PPT slide
- 5:R1 PPT explaining the four lenses of circular design
- 5:R2 Lab Story video - interviews with research team members (20 mins running time). See Thumbnails page for the video download.
- 5:R3 Video story board card prompts - excerpts of the R2 video interviews
- 5:R4a and R4b A4 sheets for note taking and Card prompts with key questions about the four lenses of circular design
- 5:R5 Illustration of the Nano Membrane Toilet system configuration
- 5:R6 Full transcript of the video
- 5:R7 Diagrams of a sanitation system from Toilet Board Coation

## ORGANISATION

- Plenary and dialogue around PPT and the Lab Story video
- Small groups (4s) around Resource prompts R3 to R5
- Plenary debrief

## TASK(S) AND RUNNING ORDER

1) Dialogue around the PowerPoint R1. Why is it important to provide a reference point to circular design through these four lenses?
2) Play the 'Lab story' video.
3) Use the video to discuss in small groups how each of the four lenses is considered in the design of the nano membrane toilet.
4) Feedback and debrief from each group to the plenary.
5) Plenary reflection: what other dimensions do we need to consider when creating new mindsets for design?

## TIMINGS

Overall approximately 140 minutes. Task 1: 20 mins; Task 2: 20 mins; Task 3: 60 mins; Task 4: 20 mins; Task 5: 20 mins.

## AIM OF THE ACTIVITY

To provide a reference point to circular design by understanding the dimensions of design thinking and circular economy to create a new mindset for design.

## GUIDANCE FOR FACILITATORS INCLUDING DEBRIEFING NOTES

**The Nano Membrane Toilet Lab Story video (R2) and story board cards (R3) act as a lead to prompt discussion in groups about a reference point to circular design. Although we propose four lenses for explain the overarching dimensions of design thinking and circular economy, these are not limiting and further reflection should prompt other dimensions to consider when creating new mind sets for design.**

### TASK 1

PowerPoint R1 introduces the four lenses of circular design. These four lenses came about from an extensive literature review to provide a reference point for circular design. Use the PowerPoint slides to develop dialogue around the overarching dimensions of design thinking and circular economy. Design thinking is a method that designers use to meet people's needs and desires in a technologically feasible and strategically viable way (Brown, 2008). Circular economy in its short definition is a system that is restorative by intention and design (Ellen MacArthur Foundation, 2012). This definition puts design as a core element to achieve the transformation needed towards a circular economy. Between design thinking and circular economy there are overarching dimensions such as: Lens 1: life cycle of products/services/systems and the use of material and resources considering open and closed-loop systems; Lens 2: meeting people's needs according to their own context/system; Lens 3: technological advances taking place in specific economic landscapes; and Lens 4: systems thinking and context setting.

In the discussion, ask: why is it important to provide a reference point to circular design through these four lenses? What are the overarching elements of design thinking, systems thinking and circular economy that are important to create new mind sets for design?

### TASK 2 3

Invite participants to watch the video R2 in small groups. The video R2 prompts discussion based on an invention following circular design principles. The video is a 'Lab Story' based on current research conducted by Cranfield University to re-invent the toilet. The video gives a snap shot of different researchers talking about their contribution to this nano membrane toilet invention.

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## GUIDANCE FOR FACILITATORS INCLUDING DEBRIEFING NOTES (continued)

*Task 2 and 3 continued.*
Discuss the video in small groups using the resources R3 to R5. Mainly use the story board abstracts/cards (R3) from the video to discuss how each of the four lenses is considered in the design of this toilet.

Note that R4 is presented in two formats: a) as A4 sheets presenting each lens and allowing participants to write notes when they are watching the video and b) as four cards presenting key questions around the four lenses of circular design to prompt discussion on the design of the toilet.

R5 presents the Nano Membrane Toilet system configuration. This resource helps participants to further understand the technical aspects of the toilet.

Allow each small group of participants to have a discussion around the video, the toilet system configuration, and the four lenses of circular design. Ask them to capture points of tension and/or agreement on the R4a A4 sheets and/or flip charts to present back to the plenary.

Note that R6 provides the full video transcript - as facilitator, this may be a useful resource for you during preparation of this activity (you can cut/paste with this document to create additional stimulus materials).

## TASK 4 5

The follow up to the small group discussions around the video and the four lenses is to present to plenary a debrief of each group discussion. Then, at the end of this plenary ask participants to reflect on the question: what other dimensions do we need to consider when creating new mindsets for design? This discussion is important because these lenses are not set in stone and further reflection should prompt other ideas.

Facilitator clues: other dimensions could include the interrelationship of the business model with the design aspects of the toilet. The discussion could focus on value creation and distribution with materials using the 'power of loops' (Ellen MacArthur Foundation, 2012), and how the 'revenue streams' may be transformed to 'social capital'.

### POSSIBLE EXTENSION ACTIVITY

R7 can be used to prompt further discussion beyond the Nano-membrane Toilet to identify the circular design dimensions when comparing with alternatives such as flush toilets connected to sewers, or toilets with container-based collection. R7 is a sanitation system diagram from the Toilet Board Coalition. This shows human waste (which the Toilet Board rebrands as 'Toilet Resources') being valorised as a wide range of material and energy products. This is significant not only in technical/design terms, but in its effect on the economics of the whole system. The Toilet Board Coalition argues that the failure to reach 2.4 billion people with sanitation is an economic issue – traditional models making sanitation a large public or philanthropic cost are problematic, whereas circular models might yield new revenue sources which reduce the public cost and so speed scale-up.

### SUPPLEMENTARY RESOURCES

For Task 3 the following videos and resources could help to inspire the discussion.

- The Evolution of Design thinking - Tim Brown CEO of IDEO, explains how the design process is evolving to support the circular economy. https://youtu.be/QeoqUkKM_-4
- Design for the Circular Economy - Tim Brown explains the circular economy and why designers have to get involved https://youtu.be/yAvkM7B7BBs
- Reinventing the toilet – helping to solve sanitation issues in low income countries - https://www.cranfield.ac.uk/case-studies/research-case-studies/nano-membrane-toilet

### REFERENCES AND FURTHER READING


Biomimicry 3.8 (2017) What is biomimicry? Biomimicry 3.8 website. Available at: https://biomimicry.net/what-is-biomimicry This gives a biomimicry design 'lens'

Brown, T. (2008) Design thinking. *Harvard Business Review,* pp 1-10'

Cranfield University (2017) Nano membrane toilet website - includes publications/reports list and blog. Available at http://www.nanomembranetoilet.org/

Ellen MacArthur Foundation (2012) *Towards a circular economy. Volume 1*

Ellen MacArthur Foundation and IDEO (2016) *The circular design guide.* Available at: https://www.circulardesignguide.com

IDEO (2017) IDEO Design Kit website. Available at: http://www.designkit.org/

Moreno, M., De los Rios, C., Rowe, Z. and Charnley, F. (2016) A conceptual framework for circular design. *Sustainability, 8(9)*, 937. Available at: http://www.mdpi.com/2071-1050/8/9/937/html

Toilet Board Coalition (2016) *Sanitation in the Circular Economy.* Available at: http://www.toiletboard.org/media/17-Sanitation_in_the_Circular_Economy.pdf

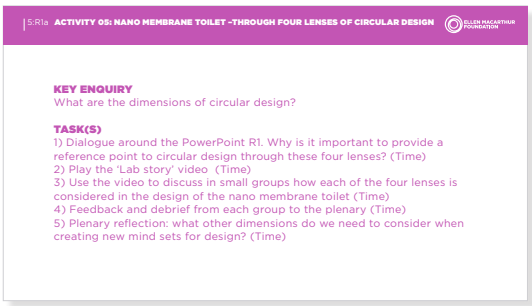

### ACKNOWLEDGEMENTS


Many thanks to Simon Widmer at Ellen MacArthur Foundation for his guidance and help with this activity.

# THUMBNAIL RESOURCES

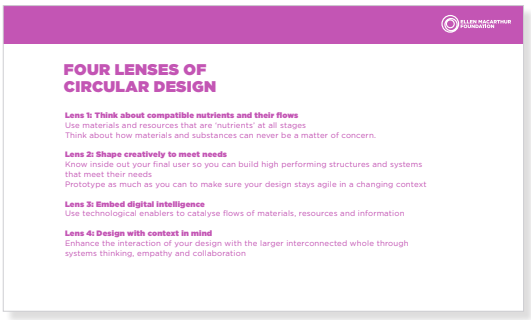
CLICK TO DOWNLOAD HIGH RESOLUTION VERSIONS FROM BELOW

### 5:R1a Intro PPT slide



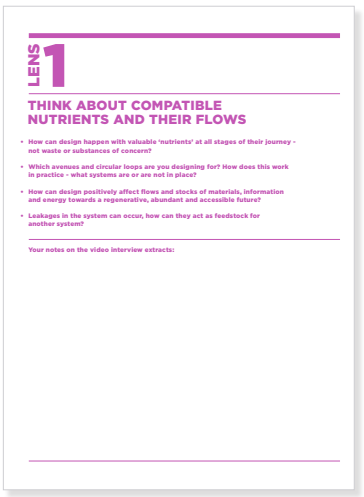

### 5:R2 Lab Story video - interviews with research team members

### 5:R1 PPT explaining the four lenses of circular design




### 5:R3 Video story board card prompts - excerpts of the R2 video interviews

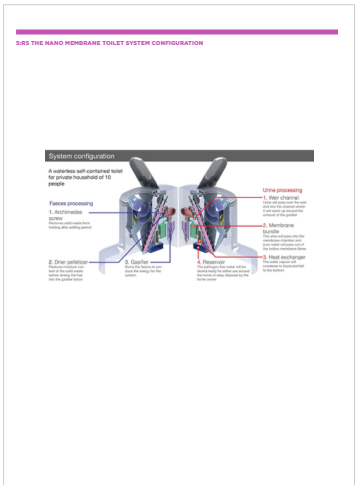
### 5:R4a



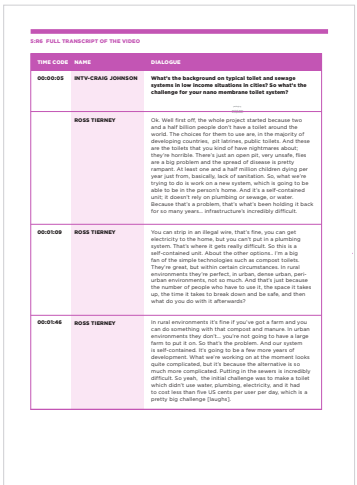

### 5:R4b



### 5:R5 The nano membrane toilet system configuration




### 5:R6 Full transcript of the video




### 5:R7 Sanitation economy diagrams from the Toilet Board Coalition