

# Environmental Impact of Disposable and Reusable Absorbent Pads: A Guide for Environmentally Conscious Healthcare Choices

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## INTRODUCTION

### Background

To reduce the environmental impact of hospitals, it is necessary to gain knowledge about the environmental impact of products and services, to be able to make an environmentally sound choice. In the hospital cellulose pads are used to absorb moisture, blood and fluids. The cellulose pad seems to be a choice with a great environmental impact, since it is used once and since it consists of different materials.

### Objective

- Aid sustainable product design by identifying substitute absorbent core materials
- Compare the cradle-to-grave environmental impacts of disposable and reusable absorbent mats, and to identify hotspots that have significant environmental impacts, in both material usage and process stages



## Literature Review: Substitute Absorbent Core Materials

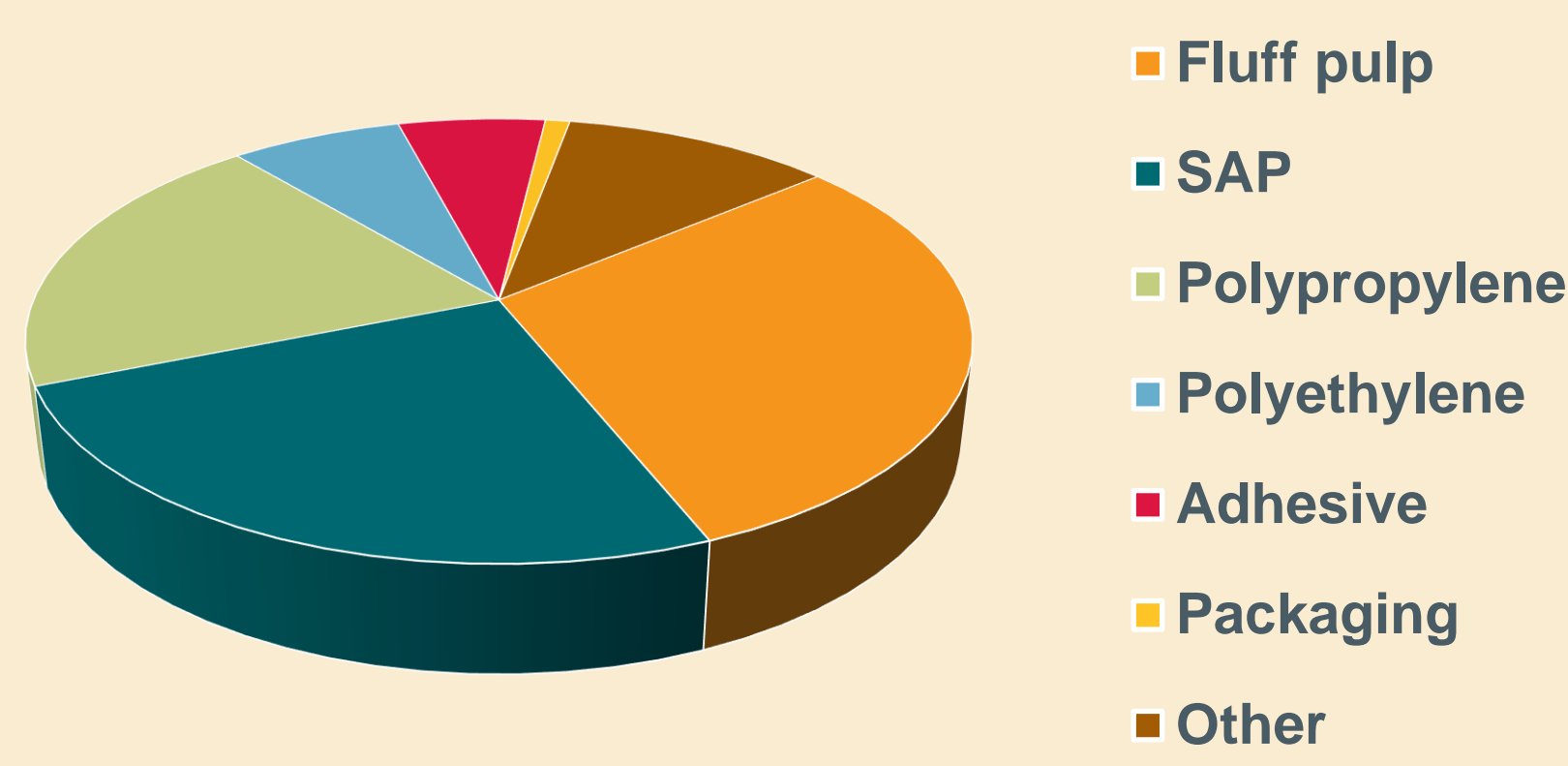
### Approach

Use diapers as a proxy for assessing the environmental impact of absorbent pads due to similar material composition.

### Objectives

- Identify material hotspots with great environmental impact
- Identify substitute materials for the material hotspots with great environmental impacts

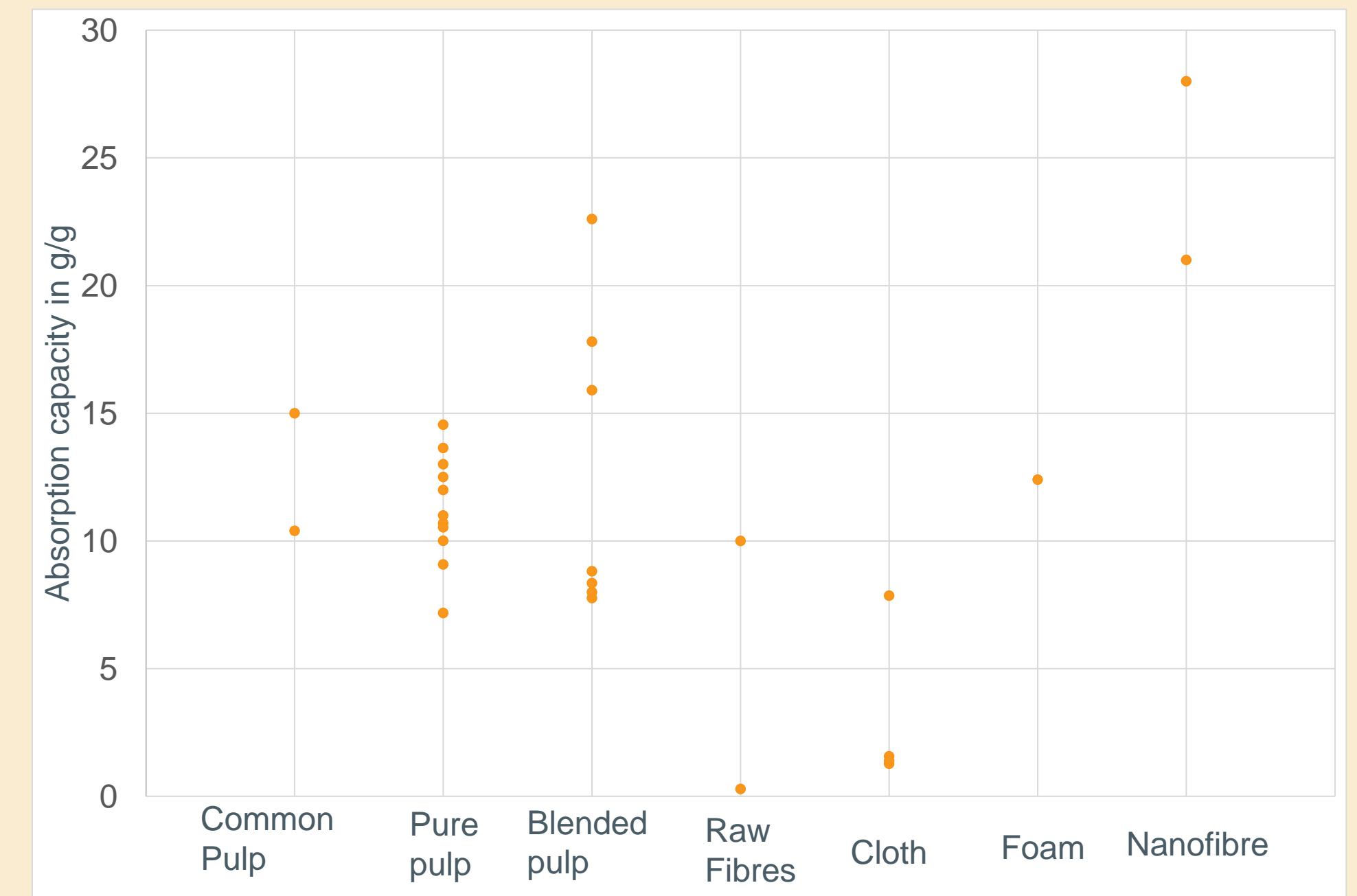
Global Warming Potential <sup>1</sup>



### Results

- Absorbent core material fluff pulp and super absorbent polymer (SAP) have the greatest environmental impact
- Identification of eleven fluff pulp substitute materials
- Identification of one SAP substitute material, namely cellulose acetate nanofibre

Substitute Material Absorption Capacity



## Absorbent Pad Usage

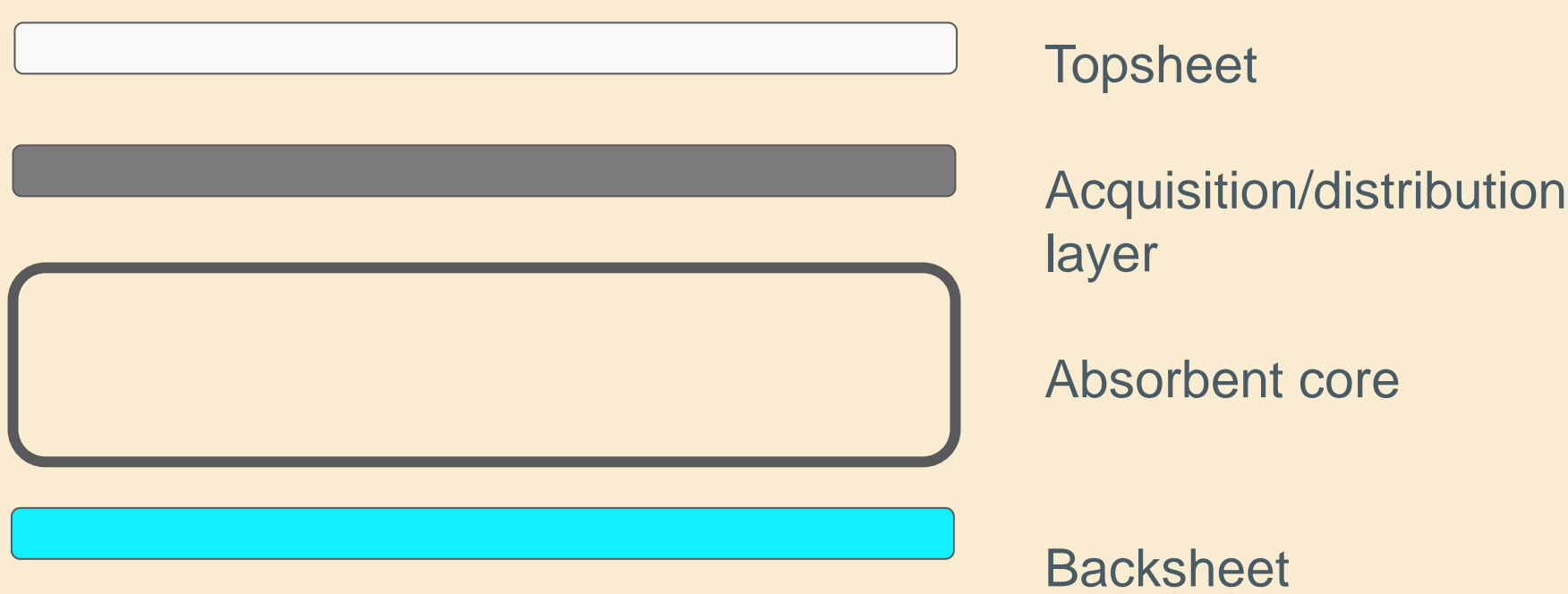
### Inventory LUMC <sup>2</sup>

- 240.000 disposable high absorbent pads purchased annually in the LUMC
- Obstetrics Department is the biggest consumer (22%)
- Costs €0.16 per disposable mat

### Usage obstetrics department

- Used for absorption of blood and amniotic fluid during delivery of a baby
- Absorb on average 119 gram (range 5-710 gram) fluid

### Basic Material Layers



## Life Cycle Assessment

### Goal and Scope

Compare the cradle-to-grave environmental impacts of disposable and reusable absorbent mats, and to identify hotspots that have significant environmental impacts, in both material usage and process stages.

### Functional Unit

1000 absorbent mat uses to collect and retain body fluids discharged from a hospital patient to prevent spillage and to wet comfort the patient.

### Alternatives

1. Disposable Seni Soft high absorption 60x60 cm Underpad supplied by TZMO
2. Reusable absorbent 60x60 cm underpad supplied by Hebo van Dijk and washed by Cleanelease

### LCA Results

Not yet available

### Results of the research process

- Inventory analysis takes enormous amounts of time
- Maintaining close relations with suppliers is crucial for conducting life cycle assessments

**2-3** times lower environmental impact of reusable pad\*

\*Indicated by literature on diapers and unpublished literature on absorbent pads

## Reusable vs Disposable

### Materials

Layer	Disposable	Reusable
Topsheet	Polypropylene	Polyester
Acquisition layer	Cellulose and polyester	/
Absorbent core	Fluff pulp and SAP	Polyester and viscose
Backsheet	Polypropylene with polyethylene film	Polyester with polyurethane film

### Other properties

Property	Disposable	Reusable
Absorption capacity	550 or 950 gram	486 gram
Use cycles	1	100-120
Disposal	Incineration	Downcycling
Price	€0.19	€0.99

## Actions to take

**USE** Disposable Seni HE low absorbent pads **now** instead of high absorbent pads

At the maternity ward of the LUMC high absorbent pads, that absorb up to 950 grams of fluid, are the standard while on average only 119 grams are absorbed with these pads. Low absorbent pads, that absorb up to 550 grams, should be the new standard. They use significantly **less material** and are **cheaper**.

**SWITCH** to reusable absorbent pads on the long run

Reusable absorbent pads have two to three times, depending on the environmental indicator considered, **lower environmental impact** throughout its lifetime than disposable absorbent pads.

### References

<sup>1</sup> Cordella M, Bauer I, Lehmann A, Schulz M, Wolf O. Evolution of disposable baby diapers in Europe: life cycle assessment of environmental impacts and identification of key areas of improvement. *J Clean Prod*. 2015 May;95:322-31.  
<sup>2</sup> Eliza Alam. Going green: how are cellulose absorbent mats currently handled and how can this be improved? [Master Thesis]. [Leiden, The Netherlands]: Leiden University Medical Centre; 2022.  
<sup>3</sup> Giffing E, Overcash M. Reusable and Disposable Incontinence Underpads: Environmental Footprints as a Route for Decision Making to Decarbonize Health Care. *J Nurs Care Qual*. 2023 Jul-Sep; 0136(3):279-285. doi: 10.1097/NQJ.0000000000000997. Epub 2023 Mar 30. PMID: 37000935  
 Unpublished research conducted at the Radboud University of Groningen

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