

A REVIEW OF PRODUCTION AND PROPERTIES OF NONWOVEN SUPERABSORBENT CORE FABRICS USED IN DISPOSABLE DIAPERS AND FEMININE HYGIENE PRODUCTS

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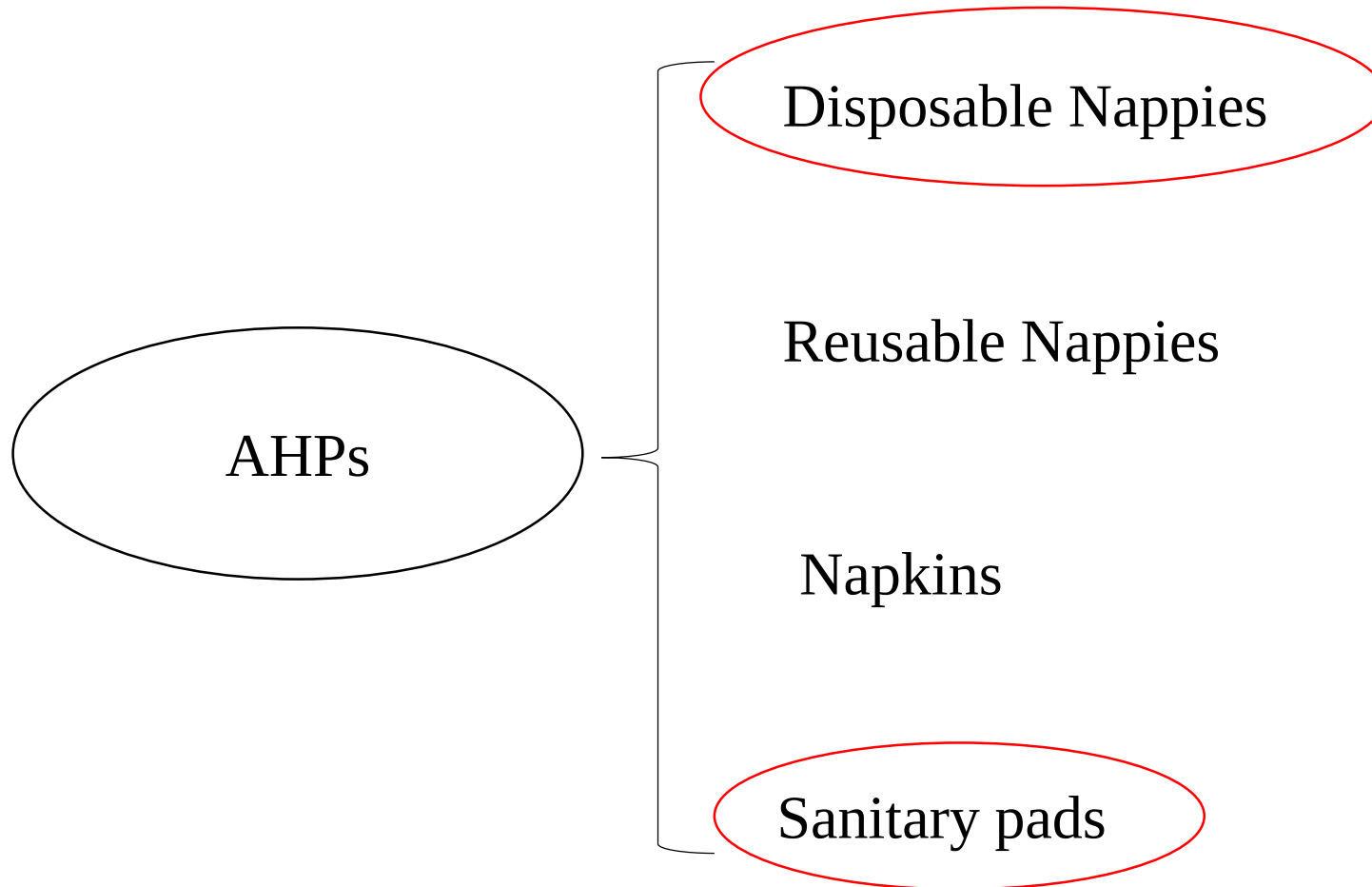
6th November 2018

AIM

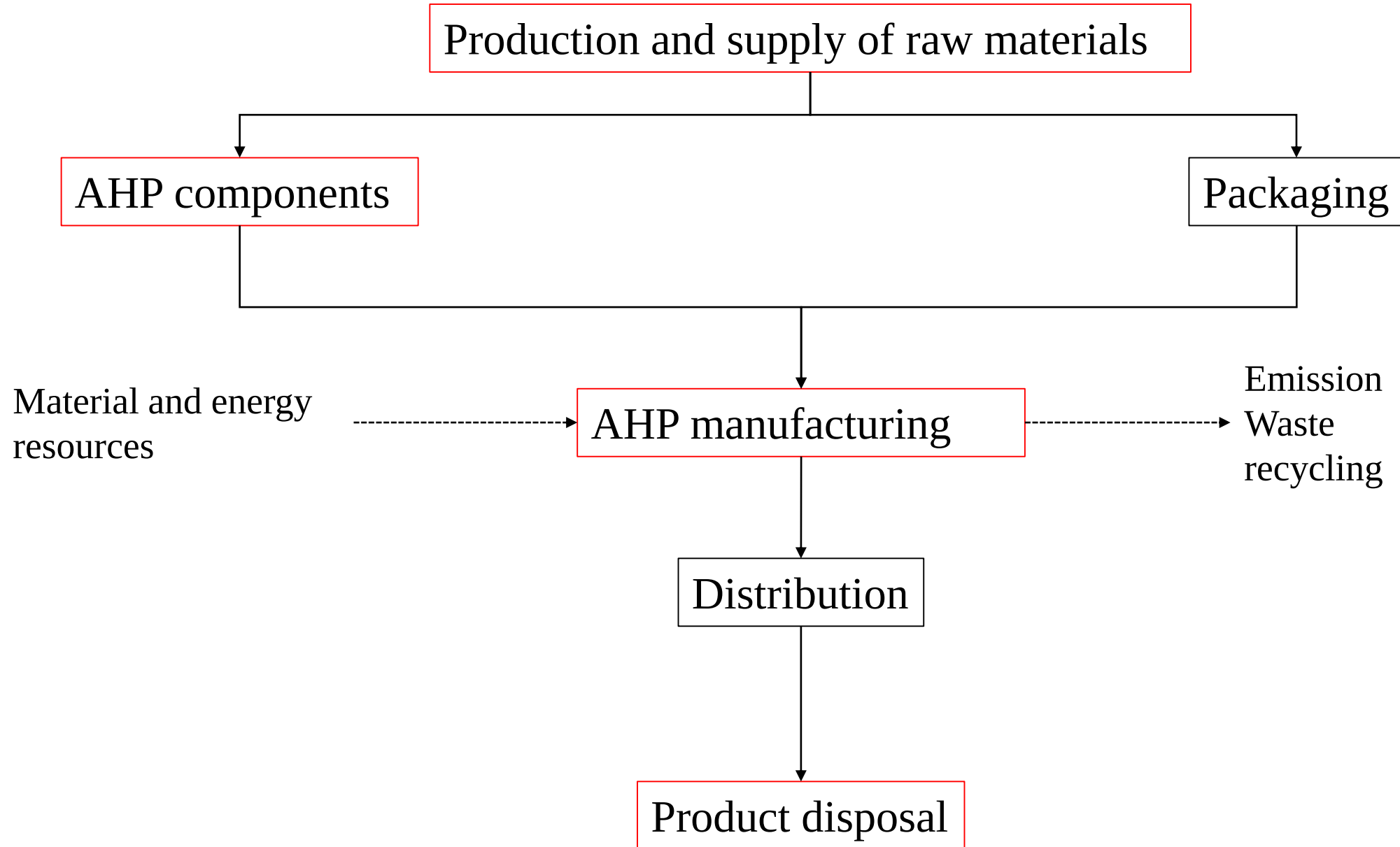


- Provide a brief life cycle assessment on Absorbent Hygiene Products (AHPs)
- Provide innovative solutions for the potential reduction and control of the environmental impacts of disposable baby diapers

What is AHP?

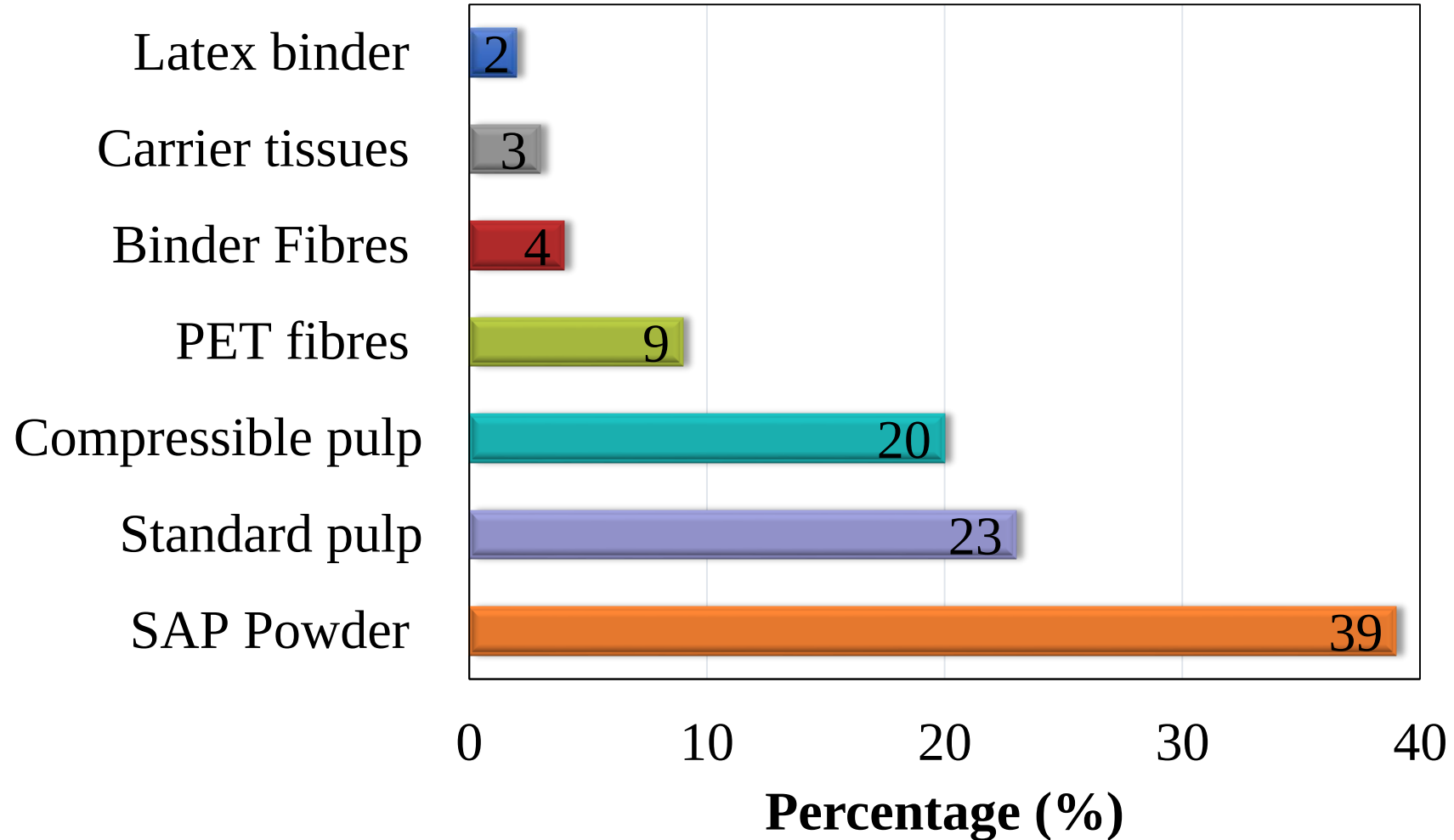


LIFE CYCLE OF A GENERIC AHPs

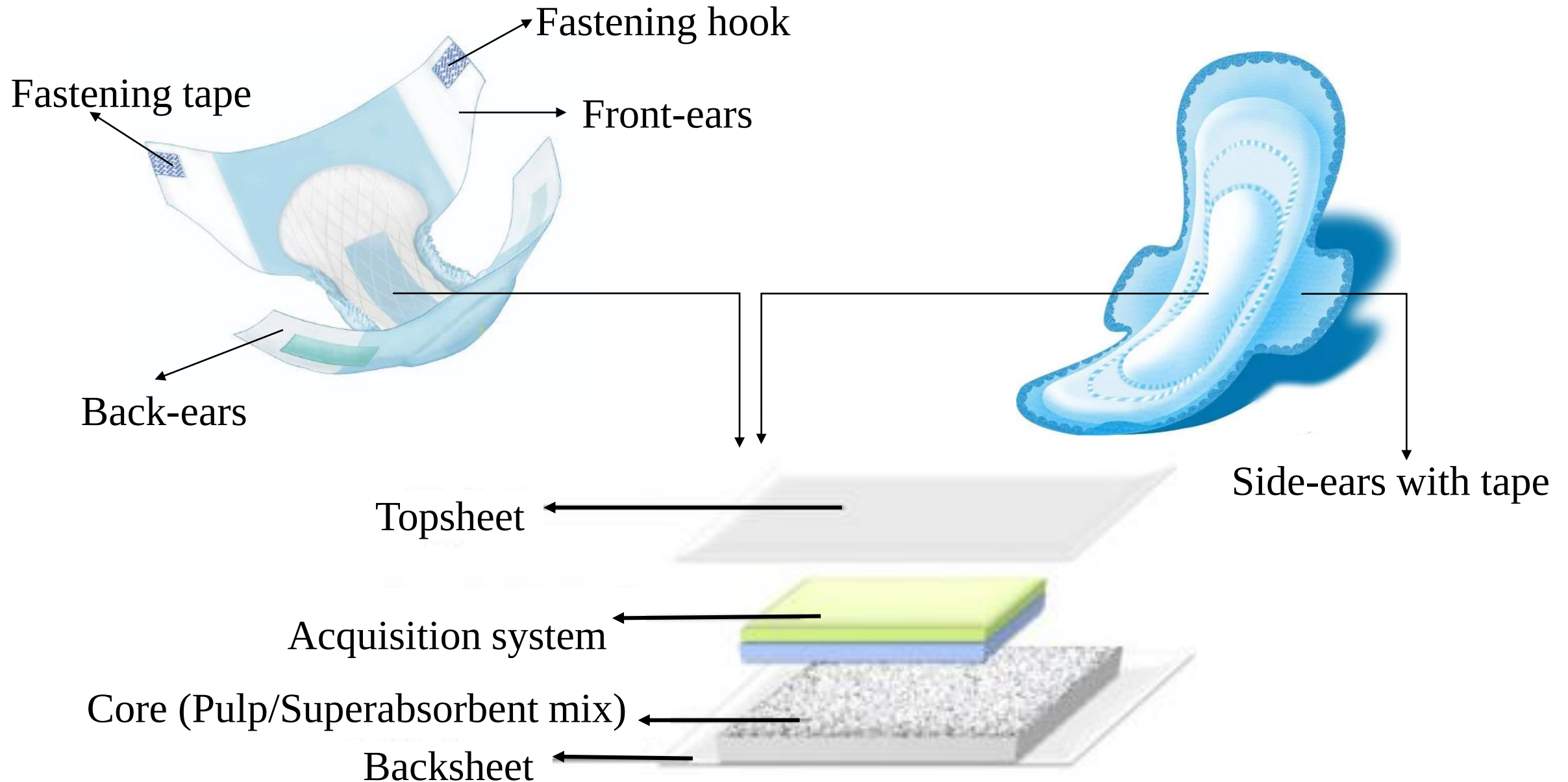


RAW MATERIALS

- A typical disposable diaper or Sanitary pad is composed of:



STRUCTURE OF DISPOSABLE NAPPY AND SANITARY PAD

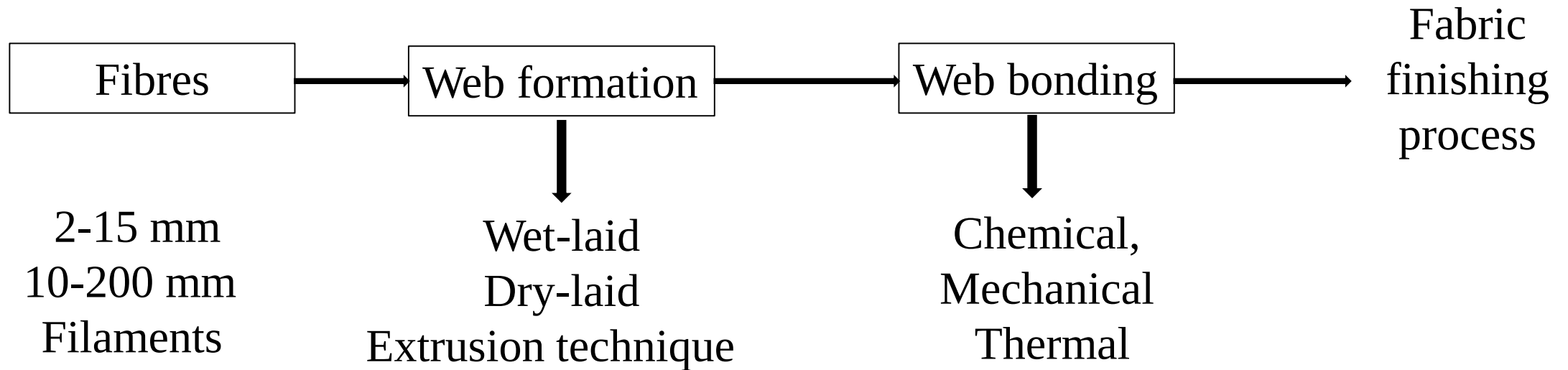


COMPONENTS AND RAW MATERIAL of DISPOSABLE DIAPERS OR PADS

- Topsheet is usually made from Polypropylene (PP) or Low density polyethylene (LDPE).
- Backsheet is also made from PP or LDPE.
- Absorbent core is made of fluff pulp and Super absorbent polymers (SAPs).
- SAPs has the ability to absorb aqueous liquid about 200 times their own weight

PRODUCTION OF ABSORBENT CORE

- Absorbent cores are made using nonwoven technologies



ENVIRONMENTAL IMPACTS

➤ *Impact related to raw material selection:*

- Presence of dioxin in the cellulose fluff pulps
- Raw material deficiency:
 - ✓ Deforestation (1 billion trees per year are estimated to keep 1 baby in disposable)
- Excessive use SAPs, a petroleum based polymer
 - ✓ Claimed to be safe and nontoxic.

➤ *Impact related to production: Air and water pollution*



ENVIRONMENTAL IMPACTS

➤ *Impact related to disposal of diapers:*

- South Africa has about 3,3 million infant population (Statistic South Africa, 2018)

Table 1: Estimated nappies produced in South Africa

Province	Babies	Number of Diapers per year (billion)
Gauteng	837372,5	1,41
KwaZulu-Natal	647770,2	1,09
Western Cape	376729,4	0,63
Eastern Cape	371130,6	0,62
Limpopo	329856,6	0,55
Mpumalanga	257402,3	0,43
North West	226398,4	0,38
Free State	168094,7	0,28
Northern Cape	69734,6	0,12

ENVIRONMENTAL IMPACTS

- If 1 used nappy weigh 230g, SA will generate about 3,47 tonnes of waste (Environment Agency, 2004).
- 1 child uses about 4,6 nappies/day for 2,5 years (EDANA, 2011)

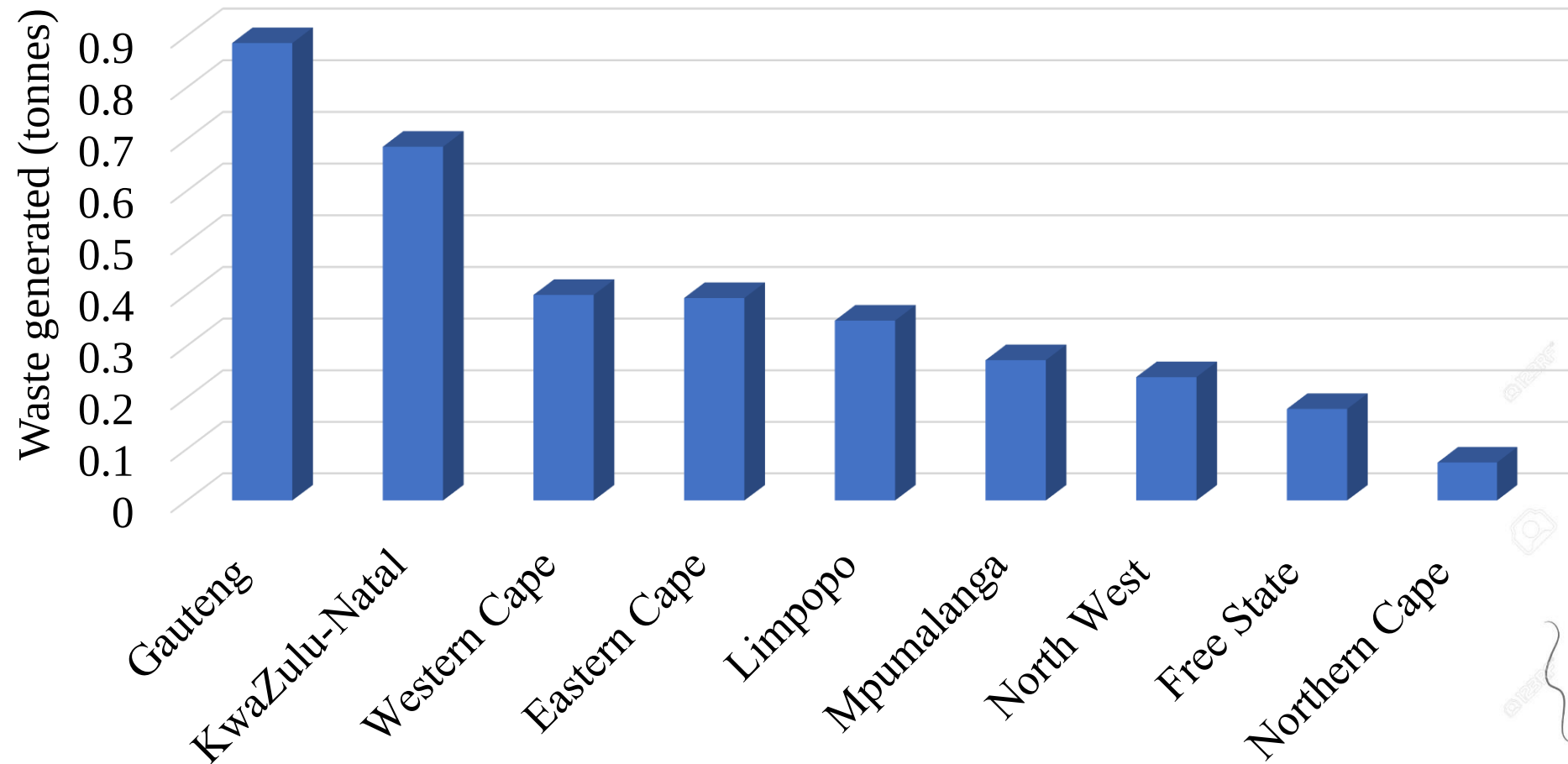


Figure 1: Estimated AHP waste generated



ENVIRONMENTAL IMPACTS



- 40 % is recycled —————→ **Knowaste (U.K.)**

- 38 % disposed in landfill

- 22 % is incinerated



SOLUTIONS



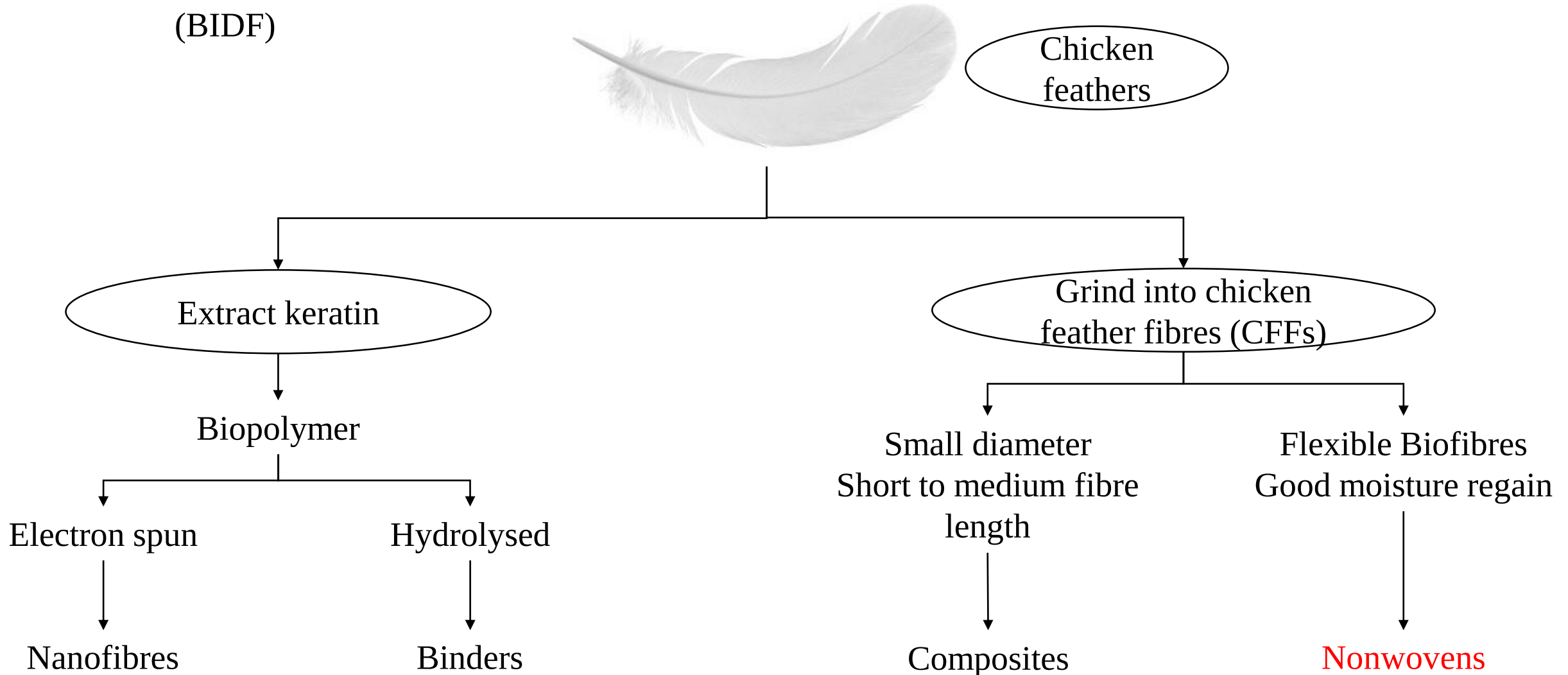
Help me...

- Use of alternative raw materials:
 - ✓ Bamboo fibres
 - ✓ Hemp fibres
 - ✓ Chicken feathers (CFs)
- Use of biodegradable SAPs
- Recycle (Knowaste technologies)



BENEFITS OF USING CFs AS ALTERNATIVE RAW MATERIAL

- Reduce CF waste: 258 million kg are generated by broilers in SA
- CFs properties have been studied at the Biorefinery Industrial Development Facility (BIDF)



PRODUCTION OF CHICKEN FEATHER FIBRES

✓ Clean feathers were converted into fibres using



Tweezer



Blender

Pulp and paper
grinding machine

BENEFITS OF USING CFFs AS ALTERNATIVE RAW MATERIAL FOR ABSORBENT CORE

Table 2: Properties of cellulose fibres vs. CFFs

Properties	Bamboo fibres	Chicken feather fibres (CFFs)
Density (g/cm^3)	1,5	0,89
Diameter (μm)	14 - 27	5 - 46,6
Fineness (denier)	37,6	76
Moisture regain (%)	13	16
Length (mm)	1-5	1-50

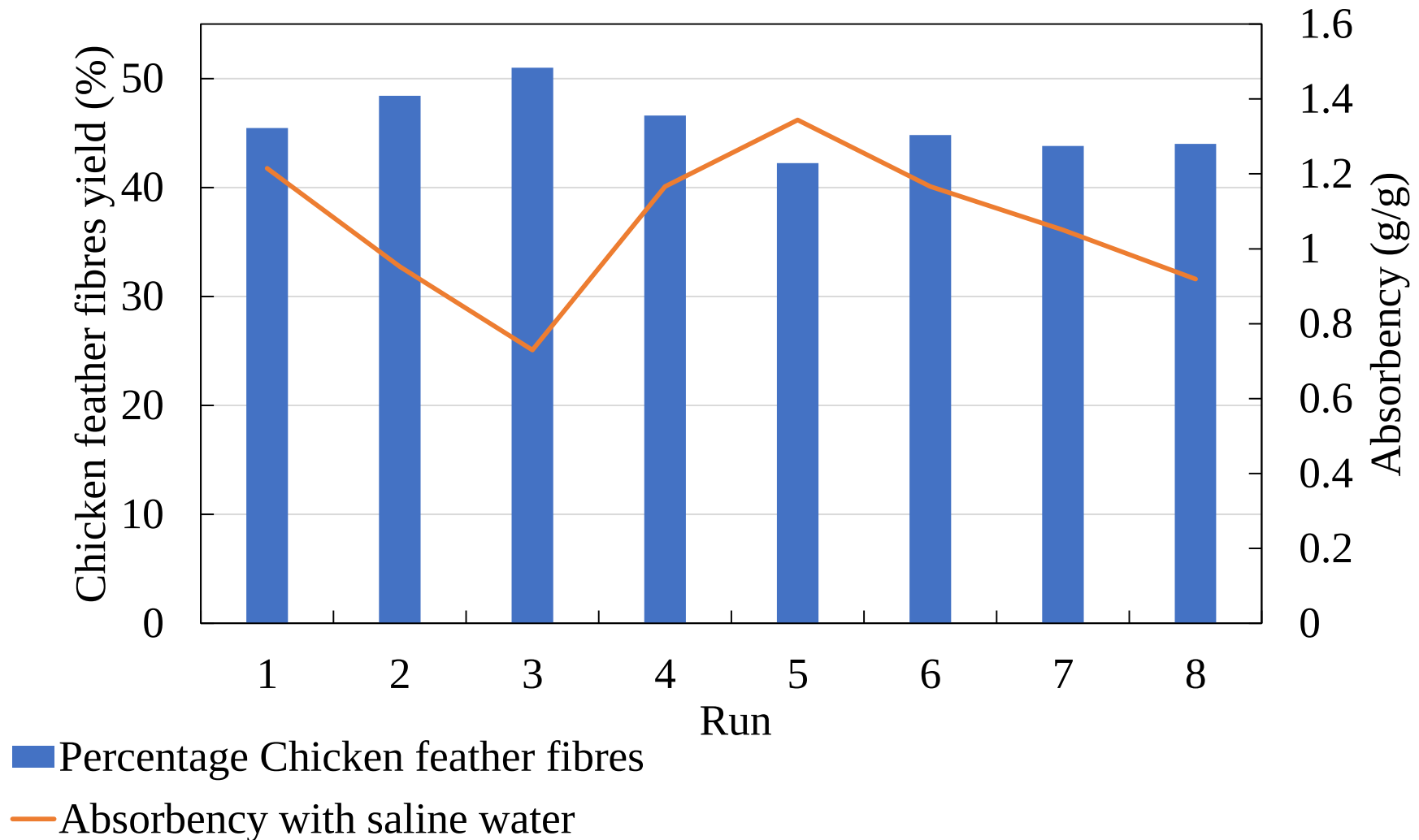
- CFFs do not contain dioxin

NEEDLE PUNCHED FABRICS

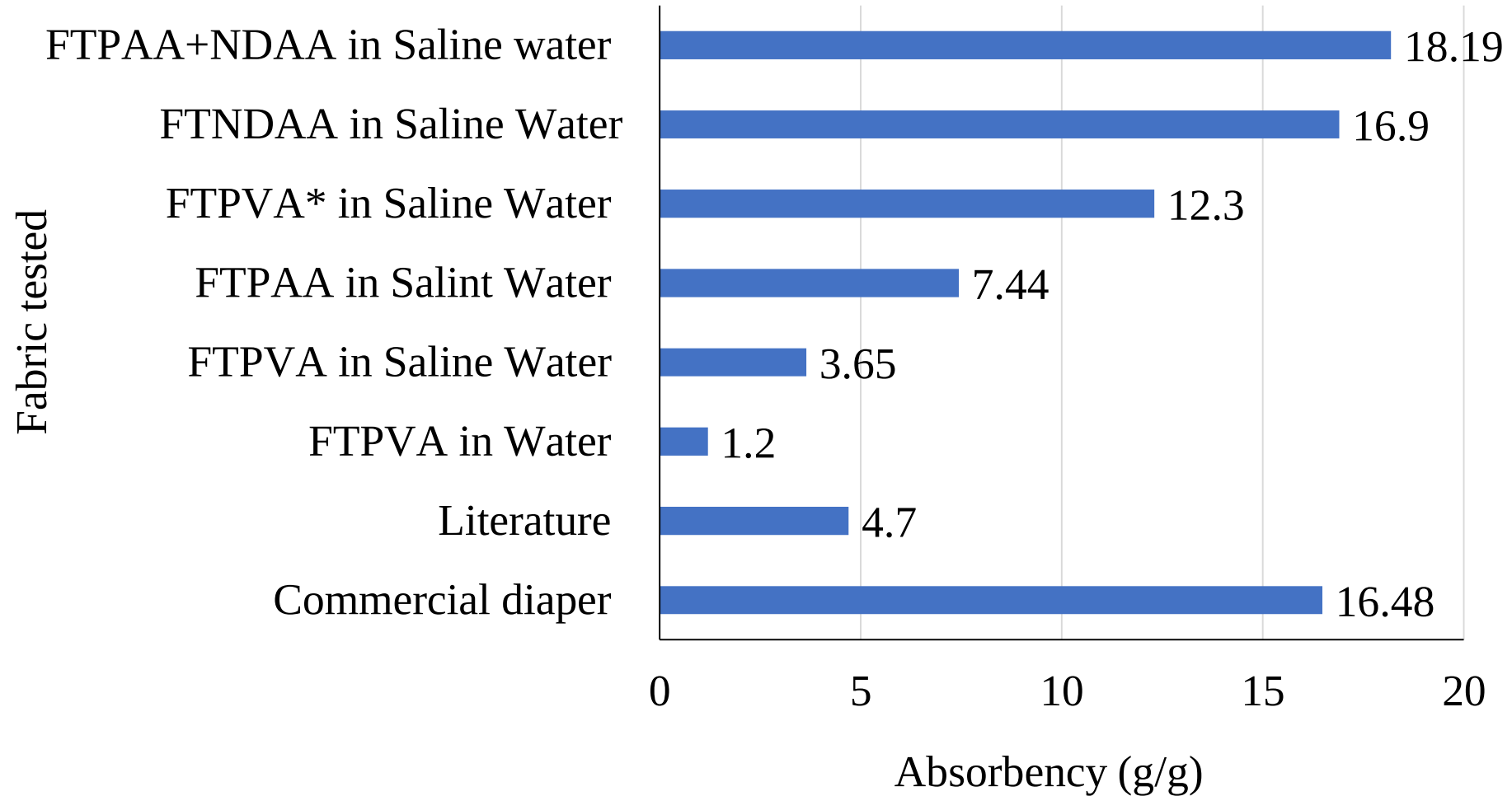


- Cotton and chicken feather were blended (50:50)

Actual ratio achieved per run and absorption ability of nonwovens produced in each run



ABSORBENCY AFTER CHEMICAL TREATMENT



- FT means fabric treated with

CONCLUSIONS

- The use of AHPs has led to a convenient and effective life style.
- The introduction of SAPs and the use of inert polymer (PE/PP) led to significant environmental impacts.
- There are alternative-sourced raw materials such as Chicken feathers that could be used to eliminate fluff pulp/SAPs nonwoven sheets.
- It is possible to produce 252 million kg of protein fibres from chicken feather waste.
- And it is possible to extract approximately 159,7 million kg of keratin to produce SAPs, adhesives and various composites to produce a full AHPs.

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