

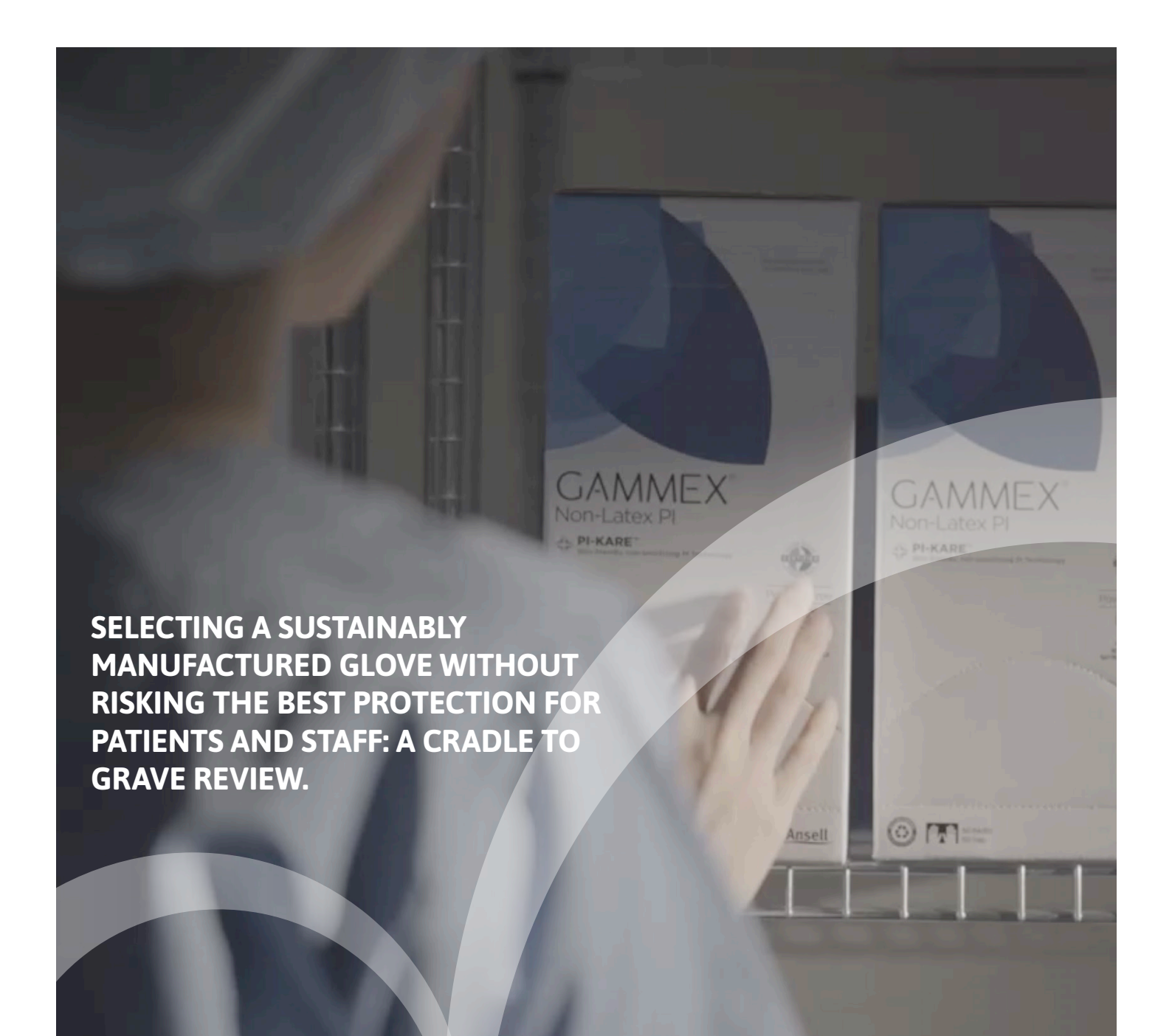


Ansell



USING THE LIFECYCLE ASSESSMENT TO MAKE SUSTAINABLE GLOVE CHOICES

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SELECTING A SUSTAINABLY MANUFACTURED GLOVE WITHOUT RISKING THE BEST PROTECTION FOR PATIENTS AND STAFF: A CRADLE TO GRAVE REVIEW.

Human-caused accumulation of greenhouse gases (GHG) accelerate climate change and is one factor impacting a product's sustainability profile. The healthcare sector, being a significant contributor to waste generation and resource consumption, seeks sustainable solutions to minimize its impact on the environment. With the substantial increase in PPE (personal protective equipment) use and waste during the Covid-19 pandemic, an area of focus is the evaluation of PPE, for positive impact on change.

When it comes to evaluating a glove's sustainable profile, it may appear natural rubber latex (NRL) gloves have a reduced environmental impact because of its renewable and biodegradable raw material.

However, the biodegradable or renewable/non-renewable profile of a glove however should not be used in isolation to determine its suitability in a healthcare setting because its primary function is to protect. Aside from the barrier protection features of a medical glove, fundamental for preventing infection from cross-contamination, decision makers must

prioritize patient and healthcare worker safety and weigh the risks of developing a latex allergy if an NRL glove is chosen. Frequent exposure to latex can increase the risk of developing sensitization, which may result in latex allergy. This can potentially destroy a professional's career or, at its worst, be fatal if an anaphylactic reaction occurs.

Making a sustainable glove choice is today not just strategic but essential for many hospitals.

The environmental impact of a glove viewed through the lens of the Lifecycle Assessment (LCA) tool, and not just the material itself, offer hospitals measurable data over and above carbon emissions to cover the comprehensive interplay of factors during a product's cradle-to-grave journey.

Regardless of the glove material (polyisoprene, neoprene, nitrile or NRL), the LCA is recommended to assess the holistic environmental impact of a glove and should be considered after evaluating its all-important barrier attributes and allergenic profile.

THE ROLE OF LIFECYCLE ASSESSMENT IN DECISION MAKING

LCA is a systematic environmental management tool standardized by the International Organization for Standardization with ISO 14040 and 14044 being the standards to establish its principles and requirements respectively.

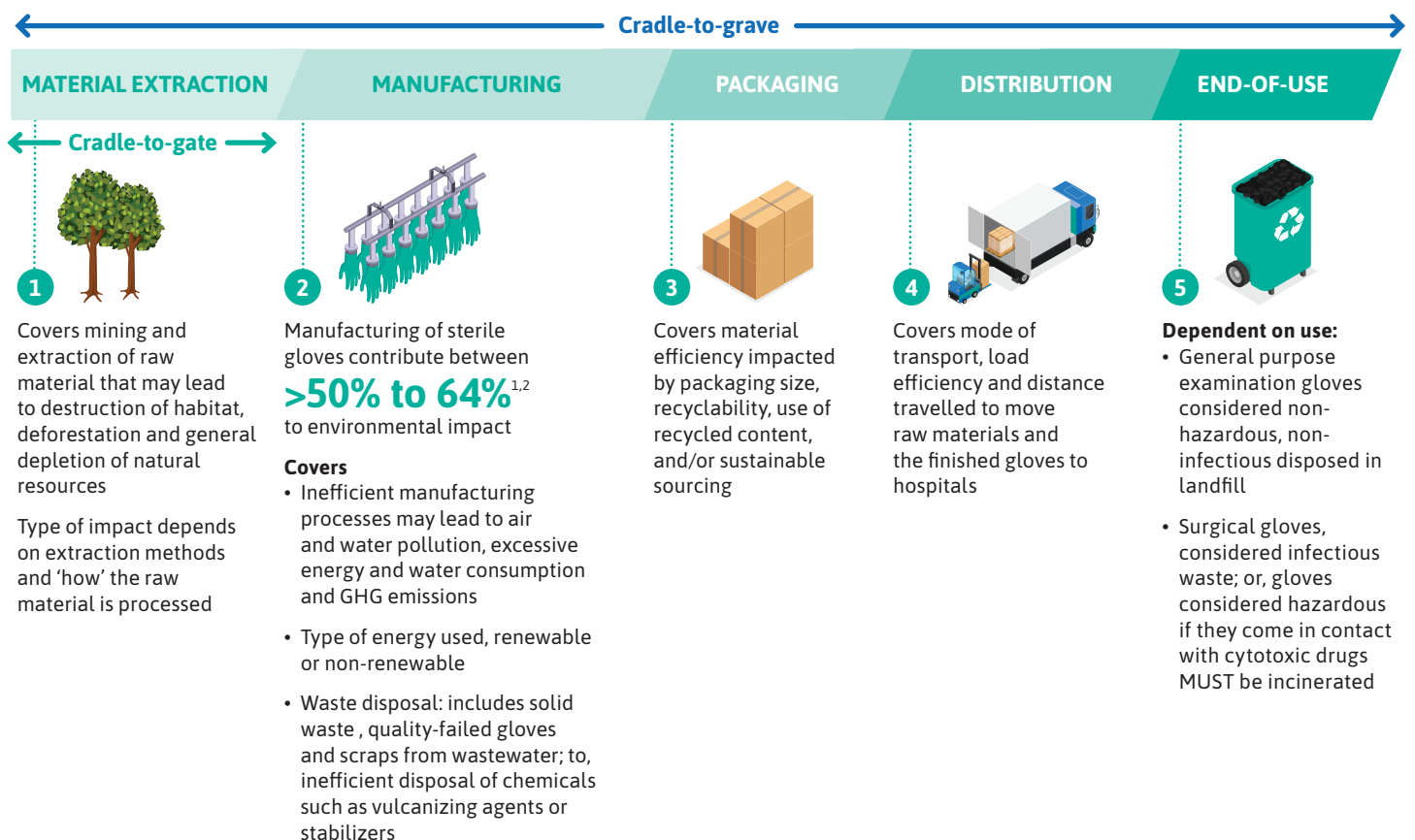
Figure 1:
The 18 environmental impact indicators based on ReCiPe Midpoint (H) V1.13/World Recipe H used in an LCA for gloves.¹



LCA takes a comprehensive approach to environmental aspects related to a product's cradle-to-grave journey, going beyond its carbon footprint. By doing so, avoiding a carbon tunnel vision when making decisions on a products' environmental impact. Figure 1 depicts a sample of the extensive scope of environmental indicators (ReCiPe LCA method)* used in a LCA study, which include carbon emissions (GHG), eutrophication, water/fossil depletion, land use and others.¹

These indicators influence the LCA outcomes of the manufacture of medical gloves framed by raw material extraction and processing (cradle-to-gate), manufacturing, packaging and the distribution and end-of-use disposal (Figure 2). The LCA tool collects measurable data and insights of a product's journey from cradle to grave, thereby assessing its overall ecological impact to guide decision making.

Figure 2:
Areas of environmental impact covered by Lifecycle Assessment (LCA) of medical gloves



How LCA can help guide decisions on sustainable choices



For hospitals: LCA outcomes allow purchasing and procurement managers to objectively compare the environmental impact of two or more glove products, synthetic to NRL or NRL to NRL. Given the protein-related allergenic risks associated with NRL gloves, if they are on the shortlist, decisions makers must consider the manufacturer's quality and manufacturing practices in order to provide a safer NRL glove to prevent sensitization leading to a latex allergy.



For manufacturers: LCA outcomes identify 'hotspots' during the products' lifecycle to guide the glove company or its suppliers' decisions on the most effective measures to reduce its environmental burden. Uncovering these hotspots further informs the design of innovative new products requiring smarter eco-manufacturing processes.

A REVIEW OF THE ENVIRONMENTAL IMPACT OF NRL AND SYNTHETIC GLOVES

As no two gloves are made the same, the environmental impact of all NRL and synthetic gloves will vary based on their respective formulations and manufacturing processes. When comparing the NRL and Polyisoprene (PI) cradle-to-grave journey (see Figure 3), the main differences are during the cradle-to-gate (raw material extraction and processing) and manufacturing stages. Other varying differences are linked to packaging and end-of-life disposal techniques associated with a glove being sterile or non-sterile.

A literature and web review of some of the differences influencing the environmental performance of NRL and synthetic gloves are shared here to help guide discussions with glove manufacturers.

REGARDLESS OF THE RAW MATERIAL, MANUFACTURING IS THE MOST DOMINANT CONTRIBUTOR

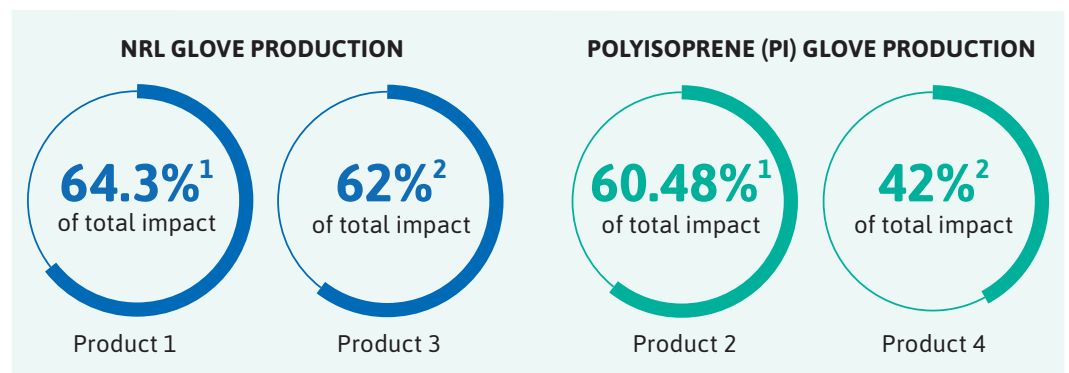
- Two studies confirmed that the **manufacturing stage of NRL and synthetic gloves** are the biggest contributor of a glove's cradle-to-grave journey, from **more than**

50% to over 64%.^{1,2}

LCA OUTCOMES VARY FROM PRODUCT TO PRODUCT AND FACTORY TO FACTORY

- Data reveals LCA outcomes of glove products will vary by factory, dependent on factors including the product type, grade of the raw materials sourced, the glove formulation, the manufacturing processes such as the speed of manufacturing, to its water and fuel consumption.

- While LCA data of 4 different surgical products^{1,3} revealed the varying outcomes, it is clear the manufacturing stage is the most dominant contributor to a glove's environmental impact, regardless of the product type or factory.



- A study comparing the impact of examination gloves made from NRL and nitrile (NBR) rubber found that while NBR gloves had a higher environmental impact at the raw material stage, they had a 22% lower single score contribution for manufacturing and fuel combustion.²

! Given that no two gloves are made the same, it is important to speak to the glove manufacturer before arriving at any conclusions on a glove's environmental impact.

STERILE GLOVES HAVE GREATER ENVIRONMENTAL IMPACT THAN NON-STERILE GLOVES

A UK study revealed that sterile surgical gloves have over 11 times greater environmental impact than non-sterile examination gloves. (11.6 times for NRL and 11.8 times for synthetic).¹ This is attributed to the more exacting demands healthcare bodies require of sterile surgical gloves irrelevant of their material:



Must meet specific performance and quality standard:

To meet these standards, stringent manufacturing processes including additional energy, water, specialized machinery, and quality testing (pre, during and post glove manufacturing) are required to ensure the glove does not fail in its primary role to protect from cross-contamination and allergy prevention.



Must be sterilized:

Sterilization methods such as gamma irradiation and ethylene oxide gas are used to sterilize gloves after manufacturing. These processes can be energy-intensive and may involve the use of chemicals, contributing to the higher impact.



Must be individually wrapped as hand-specific pairs

in a paper insert and polyethylene (PE) wrap to protect the gloves' sterile integrity. 50 pairs of these sterile gloves are then packed in another cardboard box. Conversely, non-sterile gloves are packaged in one printed cardboard box only.



Must be disposed by incineration:

Following guidelines and regulations, surgical gloves are considered clinical or infectious waste and must be incinerated to protect the environment and public health. Even non-sterile examination gloves, upon contact with infectious patients or hazardous materials are subject to disposal by incineration. During incineration, enormous amount of energy is consumed while producing fly ash, bottom ash, and fugitive gases, such as vapors or particles.³

IMPACT OF RAW MATERIALS AND PROCESSING

- **NRL:** Harvesting natural rubber latex is labor-intensive involving tapping of trees; and while sustainable practices exist, the reality of improper cultivation or deforestation can have negative environmental effects.

1 Use of nitrates from fertilizers are known to leach from rubber plantations to rivers impacting on marine ecosystems.²

2 Processing of concentrated latex requires extensive use of chemicals such as ammonia and sulphur with high water and energy dependency.²

3 Being natural, NRL gloves are biodegradable. However, biodegradation can vary greatly based on disposal methods and conditions.

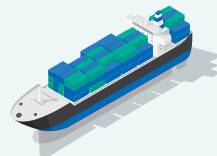
- **Synthetic:** While being less labor and land dependent, the processing of non-renewable petrochemical-derived synthetic materials, contribute to carbon emissions and fossil depletion.

PACKAGING EFFICIENCY

Most glove manufacturers are improving the recyclability and recycled content of their packaging. Ansell, the world's leading surgical glove manufacturer, has taken this a step further. In addition to using 70% & 90% of recycled materials to produce cartons and dispensers respectively to-date, Ansell moved to a smaller, more compact packaging for all surgical gloves in 2018. By reducing the square volume of the multi-layer requirements of sterile gloves, the environmental burdens have been greatly reduced.



30-50%
less packaging materials are used in the first place



27-83%
more cartons shipped per container, reducing the GHG associated with shipping

ENERGY EFFICIENCY

Reducing the dependence on fossil-based fuel is another key focus of glove manufacturing companies like Ansell who are committed to Net Zero carbon goals (Scope 1 & 2) for operations by 2040. This involves reducing GHG emissions throughout the operations by

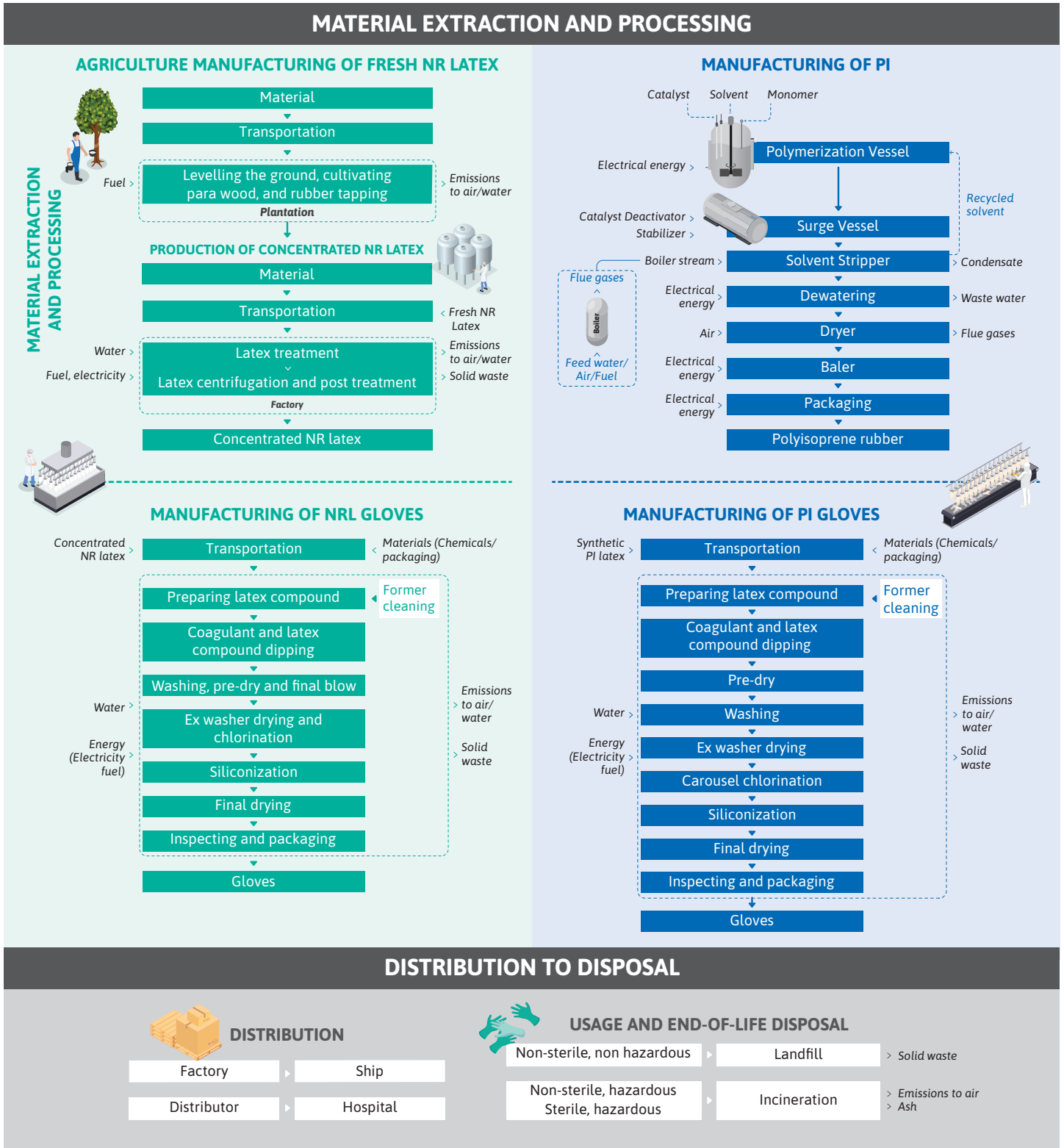


Improving energy efficiency within manufacturing processes through the adoption of advanced technologies, optimization of equipment, and upgrading of facilities.



Transitioning and depending only on renewable energy sources, such as solar, wind, bio-mass thermal energy, or other clean energy options, to power manufacturing operations

Figure 3:
Cradle-to-grave journey for glove manufacturing



CONCLUSION



1 A medical glove's primary function is to protect patients and healthcare workers. The sequence of considering barrier properties and allergenic profiles before evaluating a glove's environmental impact should never be compromised to align with a hospital's broader goals of promoting safety, health and user satisfaction.



2 LCA outcomes provide the measurable data hospitals need to objectively compare a glove's true cradle-to-grave environmental impact based on indicators beyond a tunnel vision view of looking solely at a product's carbon footprint.



3 There is no conclusive data to determine whether an NRL or synthetic glove is the most sustainable option. LCA outcomes from product to product and factory to factory will be different. The interplay of factors influencing a glove's lifecycle will ultimately determine its overall environmental impact, rather than whether a glove is biodegradable and made from renewable or non-renewable materials alone.



4 To determine a comprehensive view of a glove's performance and sustainability profile, it is always best to talk to the shortlisted list of manufacturers especially since manufacturing, the biggest contributor to LCA outcomes, vary from factory to factory.

Ansell's Sustainability Pledge

Incorporating the environmental insights gained from our Life Cycle Assessments, at Ansell we are honing our manufacturing processes for better environmental efficiency. Our strategy aims for zero waste to landfill, a significant reduction in water use, and the adoption of renewable energy. We're innovating with materials that have less environmental impact, such as bio-based content, and designing our products—80% of new offerings—to be more sustainable. This conscientious approach extends to our packaging, ensuring it is wholly recyclable, reusable, or compostable. Through these measures, we are committed in our mission to enhance sustainability and stewardship across all facets of our operations.



For more information, visit Ansell Earth or contact your Ansell representative.

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