

# Leveraging Innovation through Life-Cycle Thinking

*Sara Carniello*

# ***THE INNOVATION COMPANY***

JOANNEUM RESEARCH develops solutions and technologies for a broad range of industries and public agencies and is engaged in top applied research at an international level.

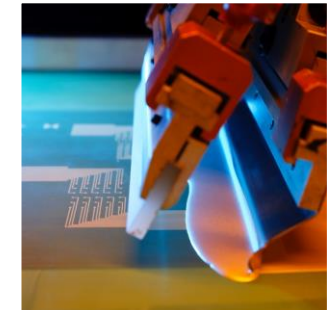
Thematic areas:

- information and production technologies;
- human technology and medicine;
- society and sustainability.



~ 500  
employees

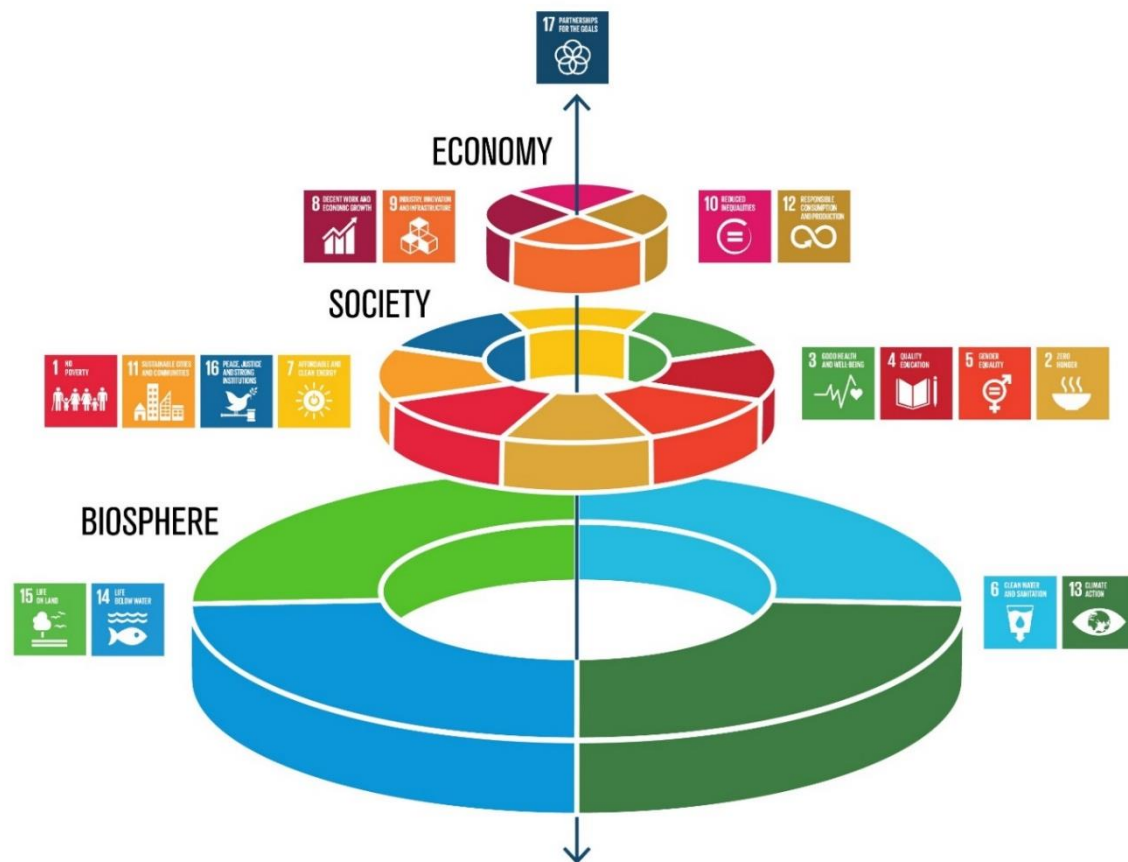
7 research  
units



6 locations

# Sustainable Development

**Sustainable development:** a development that meets the needs of the present without compromising the ability of the future generations to meet their own needs (Brundtland Report, 1987)



life-cycle thinking: follow a product in its context, through all its phases



Material, energy and information flow along the whole value chain



systemic – multidimensional – complex model

# Life Cycle Assessment

## System, models:

Map energy and material flows  
Understand the context  
Make assumptions

Objectives

System

Models

Functional unit

## Function:

- ⇒ Go beyond the actual product
- ⇒ Compare heterogeneous solutions

## LCA FRAMEWORK ISO 14040

Goal and  
Scope

Inventory  
Analysis

Impact  
Assessment

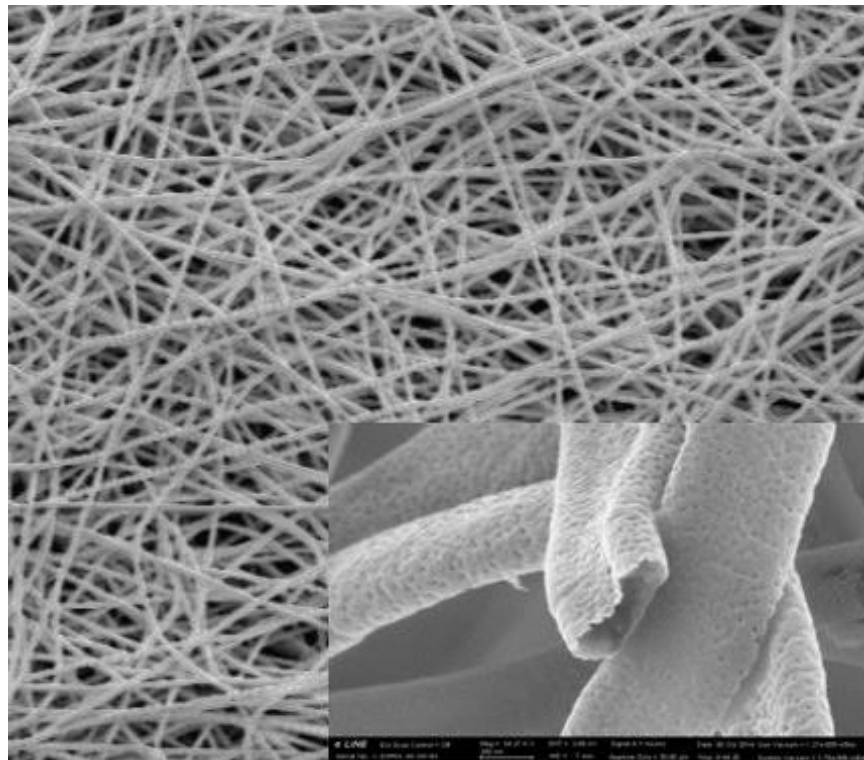
Interpretation

Support to  
decision  
making, risk  
assessment,  
mgmt systems

Compliance,  
Communication,  
Reporting

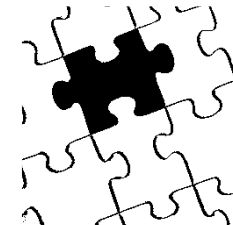
# Case study: nanoflow

## Electrospun nanofibers in microfluidic diagnostic systems



Controlled release  
of active substances

Capillary pumps,  
filters



Sensing layers

Improved system architecture

Additional functionalities

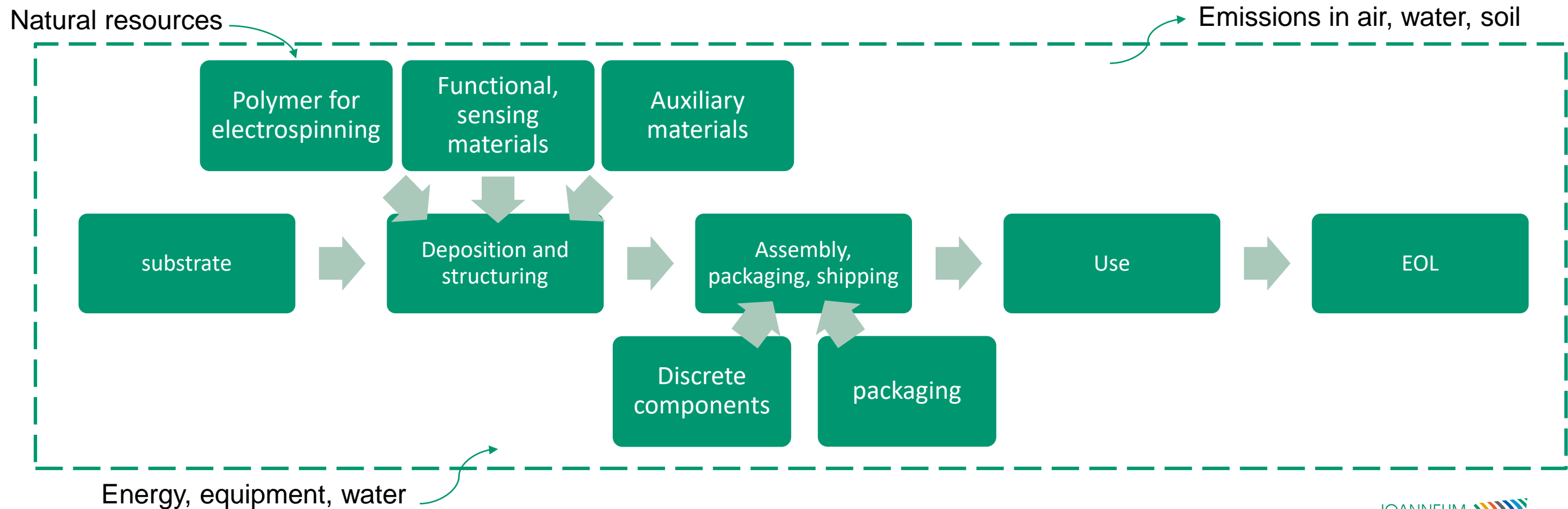
Alternative production  
processes

Quality control

# Impact assessment

Objectives:

- Compare devices with electrospun material to current architecture/process
- Compare bio-based, biodegradable and fossil-based polymers

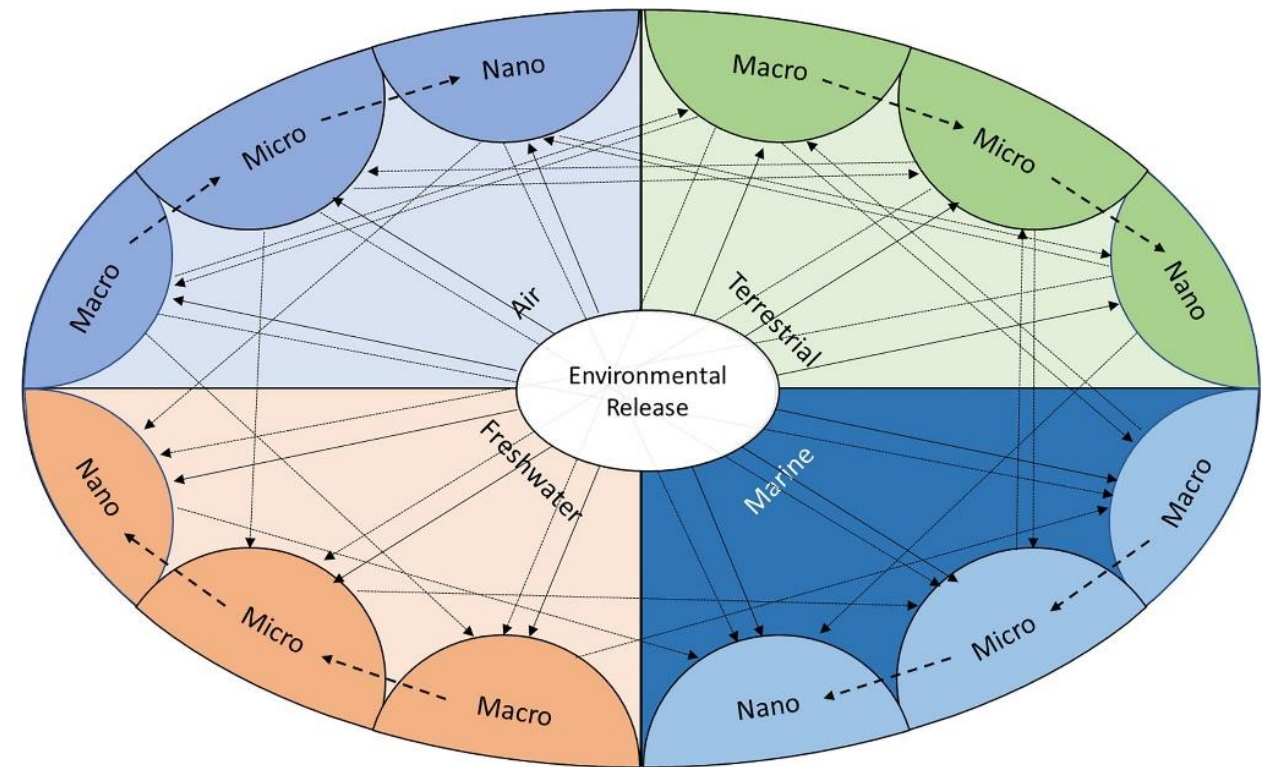


# Challenges

The effects of nanotechnologies on the overall impact assessment are not well modelled yet, for example:

- Model tiny quantities
- Impact on recyclability
- Impact of microplastics/microfibers

(pathways/fate)



*Shaping  
the future,  
together*

*Thank you for your attention!*

JOANNEUM RESEARCH  
Forschungsgesellschaft mbH

LIFE  
Institute for Climate, Energy Systems and Society

Science Tower  
Waagner-Biro-Straße 100  
8020 Graz

Phone: +43 316 876-7645  
Sara.carniello@joanneum.at

[www.joanneum.at/life](http://www.joanneum.at/life)