

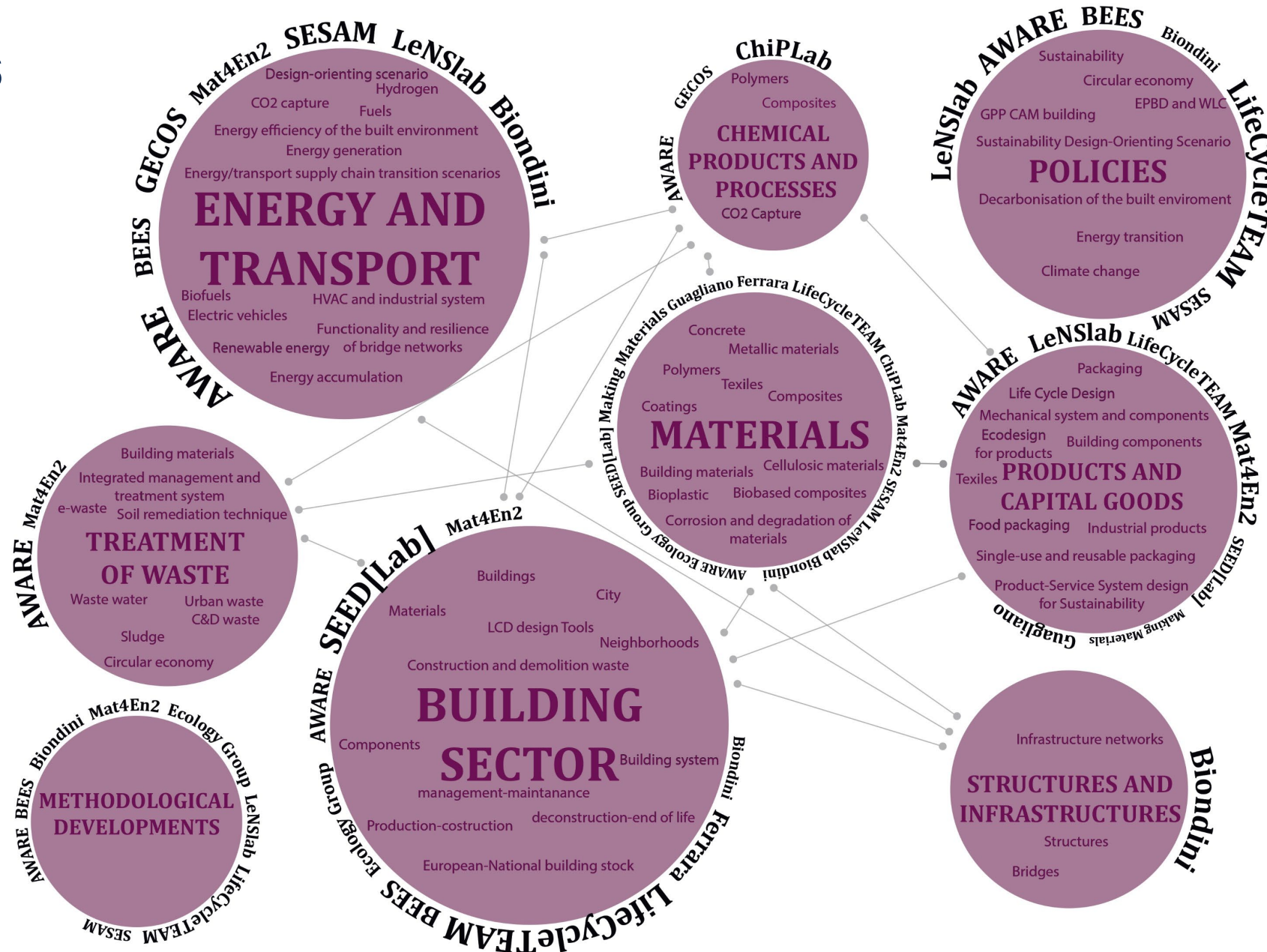


POLITECNICO
MILANO 1863

Presentation of the research groups of Polimi LCA Network

13.11.2024 | Membri Polimi LCA Network

ABOUT US



List of research groups of Polimi LCA network

Department of Architecture, Built Environment and Construction Engineering (DABC)

LifeCycleTEAM (Prof. Monica Lavagna)

SEED [Lab] (Alberto Speroni)

Department of Chemistry, Materials and Chemical Engineering “Giulio Natta” (DCMC)

ChiPLab (Prof. Marinella Levi)

Making Materials (Prof. Barbara Del Curto)

Mat4En2 (Prof. Paola Gallo Stampino)

Department of Design (DESIGN)

LeNSlab (Prof. Carlo Vezzoli)

Department of Electronics, Information e Bioengineering (DEIB)

Ecology Group (Prof. Paco Melià)

Department of Energy (DENG)

BEES (Jacopo Famiglietti)

GECOS (Prof. Davide Bonalumi)

SESAM (Prof. Matteo Vincenzo Rocco)

Department of Civil and Environmental Engineering (DICA)

AWARE (Prof.ssa Lucia Rigamonti)

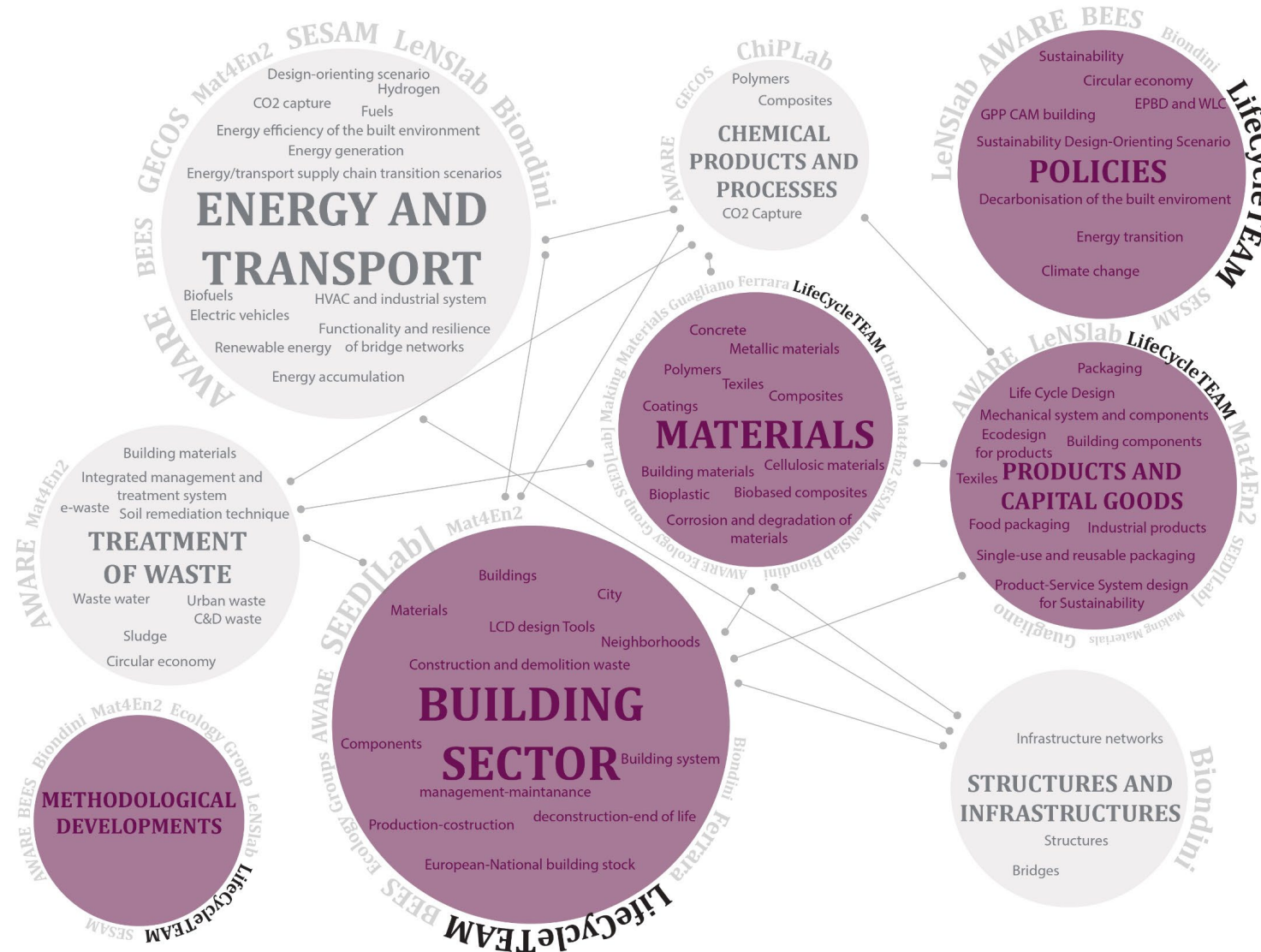
Fabio Biondini's Research Group (Prof. Fabio Biondini)

Liberato Ferrara's Research Group (Davide di Summa)

Department of Mechanical Engineering (DMEC)

Mario Guagliano's Research Group (Prof. Mario Guagliano)

LifeCycleTEAM (DABC)

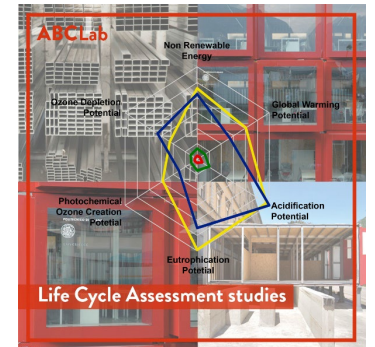


LifeCycleTEAM (DABC)

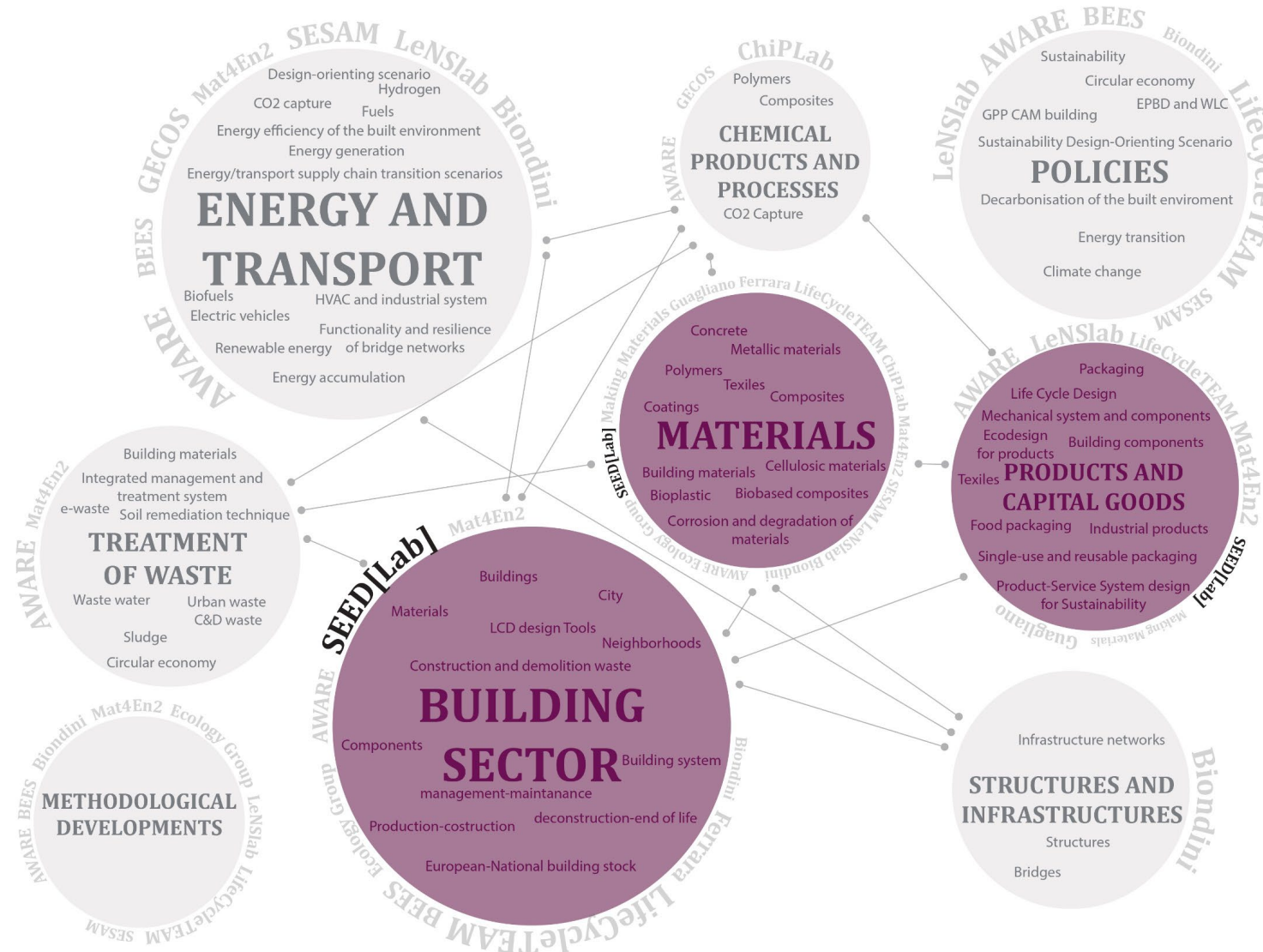
Proff. Monica Lavagna, Andrea Campioli, Alessandra Zanelli and Carol Monticelli
RTD Anna Dalla Valle, Serena Giorgi and Salvatore Viscuso, 7 PhD students, 3 collaborators

Main fields of LCA application

- LCA applied to the building sector, at the scale of the material, component, construction system, building, neighborhood, up to some territorial applications
- LCA applied to phases of the building process: production (additive manufacturing), construction/assembly, management/facility management (flexibility/adaptability, maintenance), redevelopment, deconstruction/disassembly, end of life
- LCA in Green Building Rating Systems (e.g. Levels, LEED, BREEAM, ITACA)
- LCA/Carbon footprint of buildings and Sustainability Report (New GPP Code)
- Methodological developments in the LCSA (Life Cycle Sustainability Assessment)
 $LCSA = LCA + LCC + SocialLCA$ for the building sector
- Support for the use of LCA in policies (e.g. CAM building criteria, new EPBD IV)
- Development of LCA-based digital tools in a BIM environment
- LCA in the circular economy and textile supply chain (e.g. textile recycling)



SEED [Lab] (DABC)



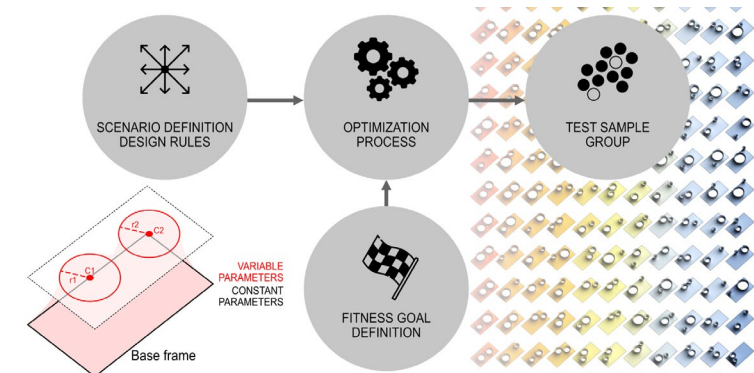
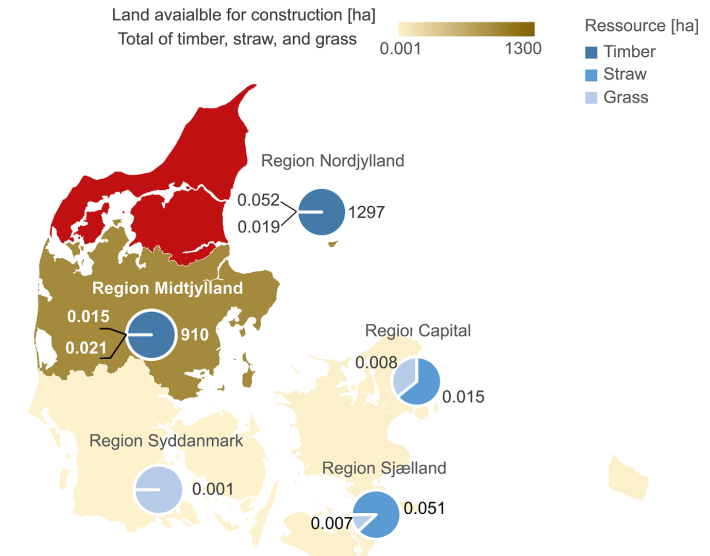
SEED [Lab] (DABC)

Representative: Francesco Pittau, Alberto Speroni | **Coordinator:** Tiziana Poli

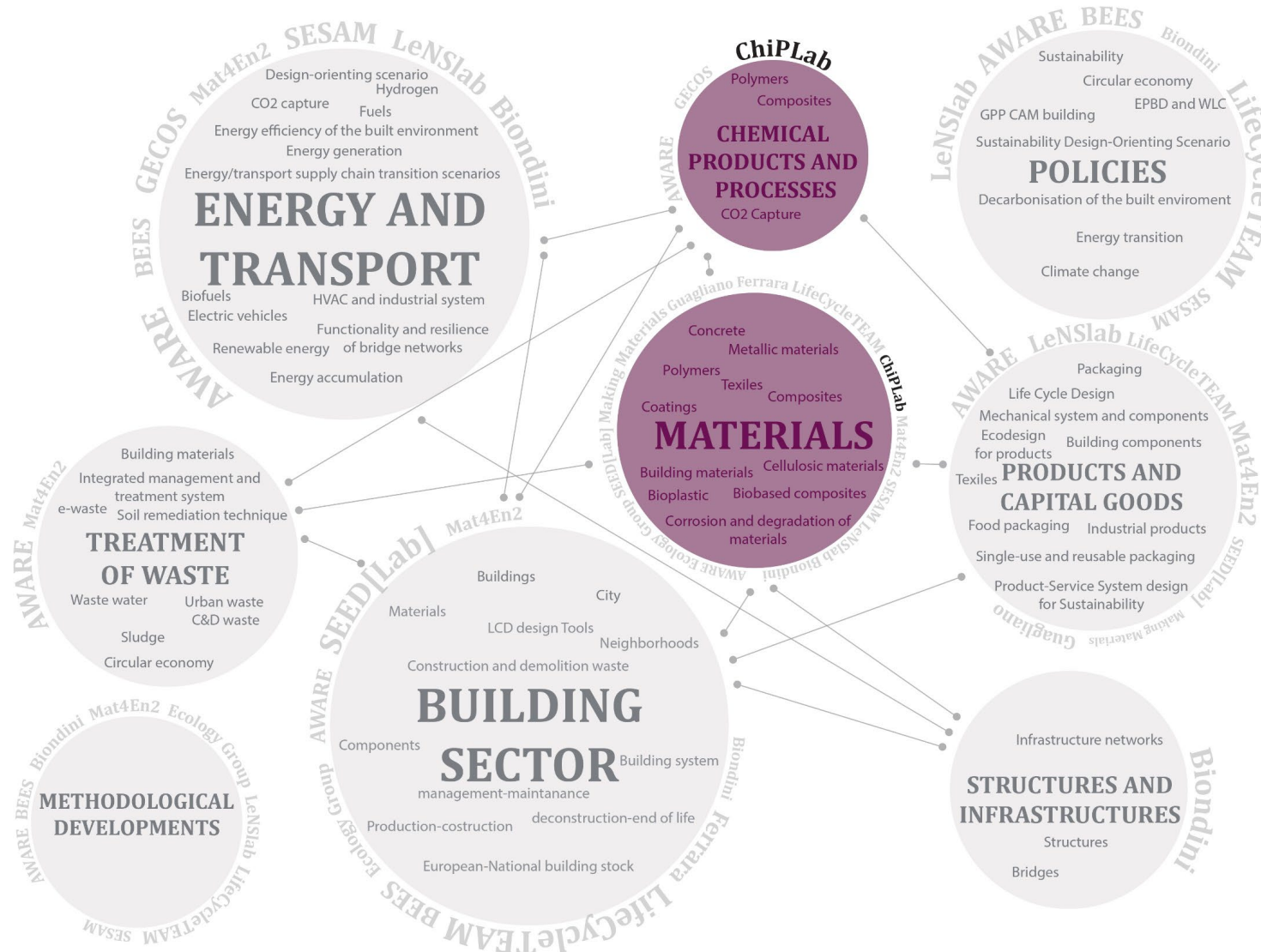
Research Group: 3 Prof. Ordinari, 3 Prof. Associati, 2 RTD, 4 PhD students, 2 research fellows

Main fields of LCA application

- Environmental impact assessment of the construction sector at the various life cycle stages at different scales (material/component, building, territorial/building stock)
- Development of indicators and models for assessing the circularity of products and value chain
- Carbon footprint assessment of bio-based construction solutions and carbon storage potential
- Development of dynamic LCA models for carbon footprint assessment at different building scales
- LCA for the definition of low-carbon intervention strategies for the regeneration and rehabilitation of infrastructure networks
- Integration of parametric LCA for the design and development of innovative products/components



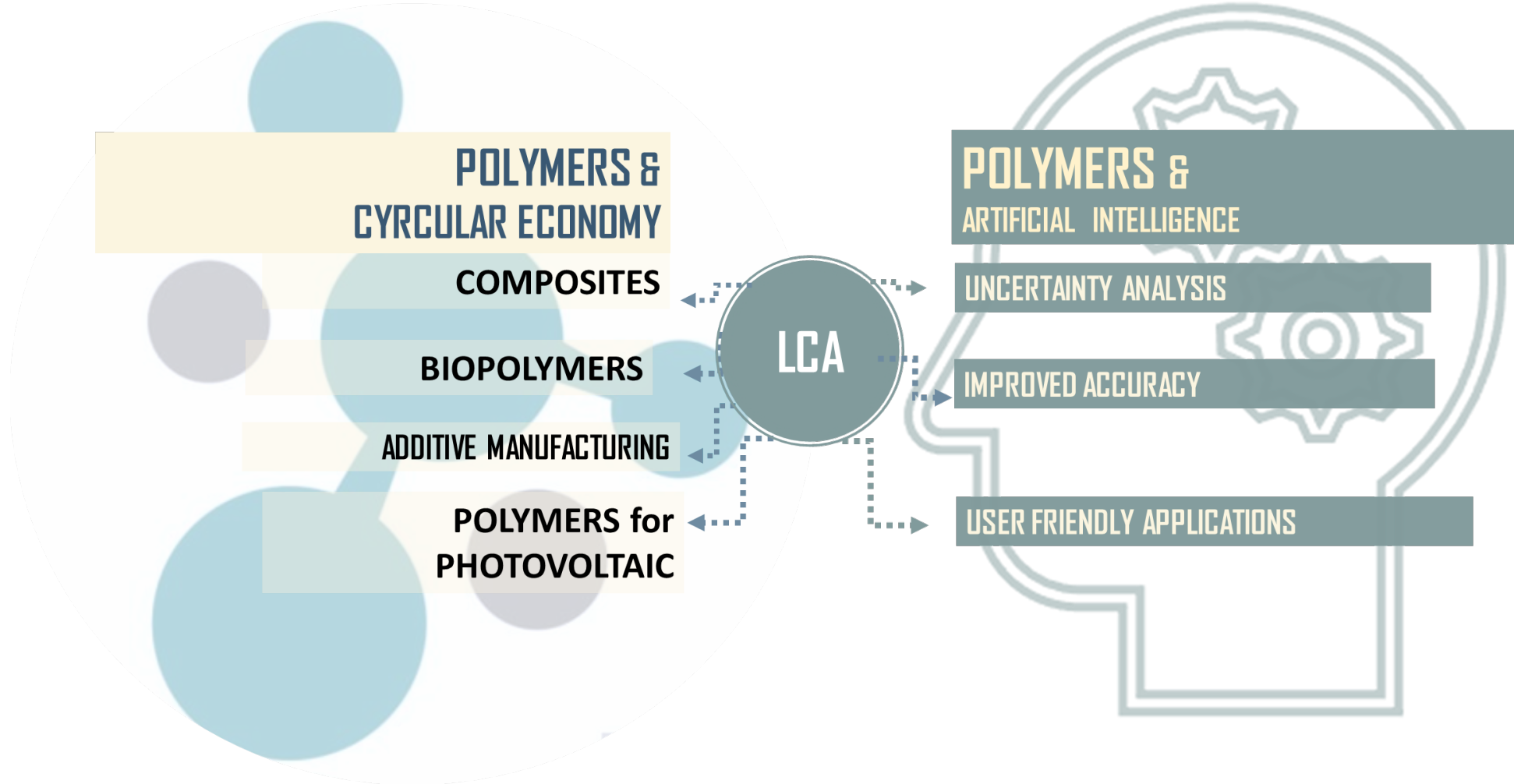
ChiPLab - Laboratory of Chemistry and Characterization of Innovative Polymers (DCMC)



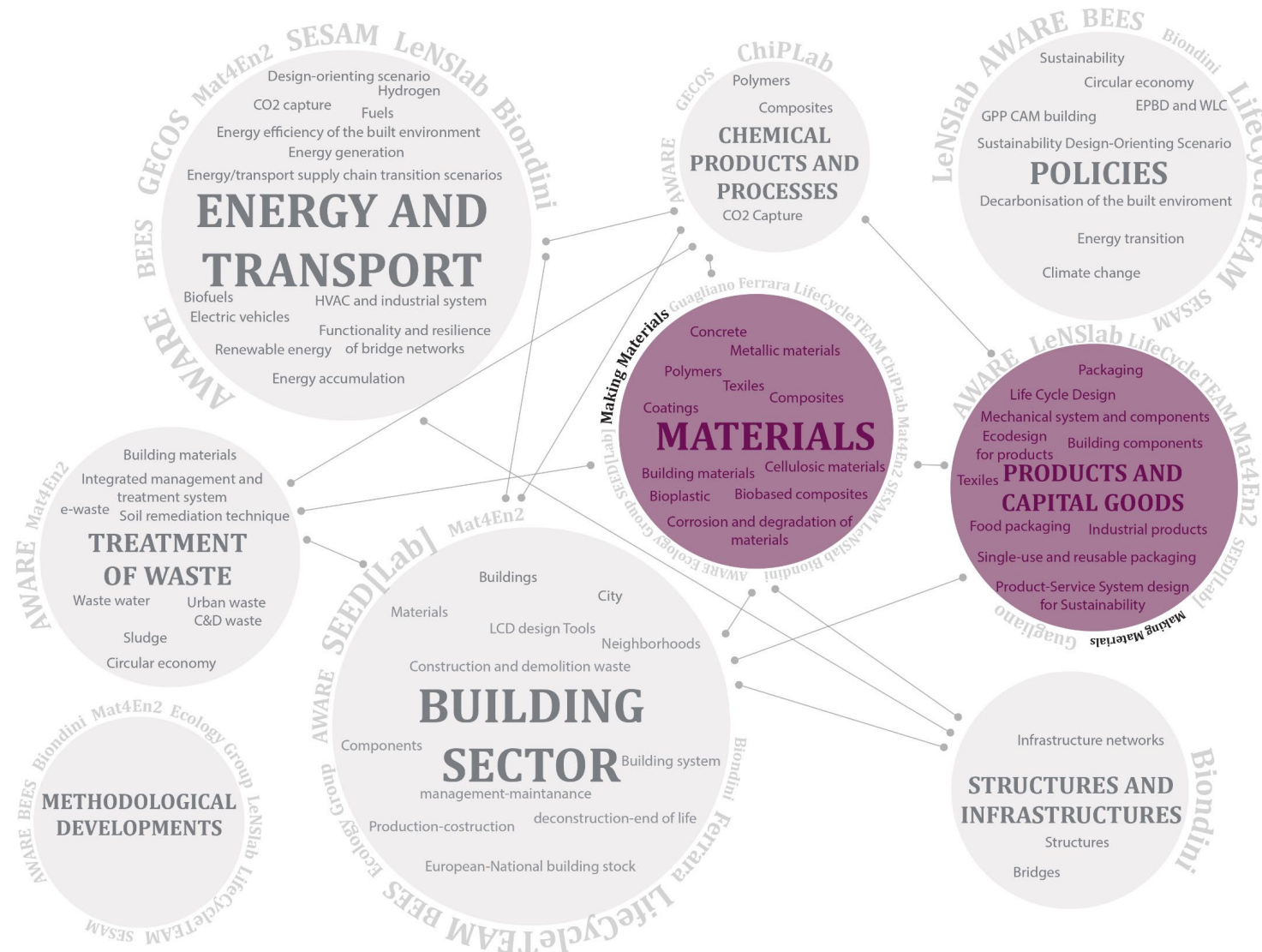
ChiPLab - Laboratory of Chemistry and Characterization of Innovative Polymers (DCMC)

Proff. Marinella Levi, Stefano Turri, Raffaella Suriano, Gianmarco Griffini, and Marco Cavallaro

Main fields of LCA application



Making Materials (DCMC)



Making Materials (DCMC)

Prof. Barbara Del Curto, 1 RTD, 1 research fellow, 1 PhD student, and 1 collaborator

<https://makingmaterials.cmic.polimi.it/>

The group deals with material selection criteria, strategies for sustainable use of materials in design, CMF design to induce sustainable behaviors, composite design from waste, and application for generating micro-mills for social purpose (...and more!)

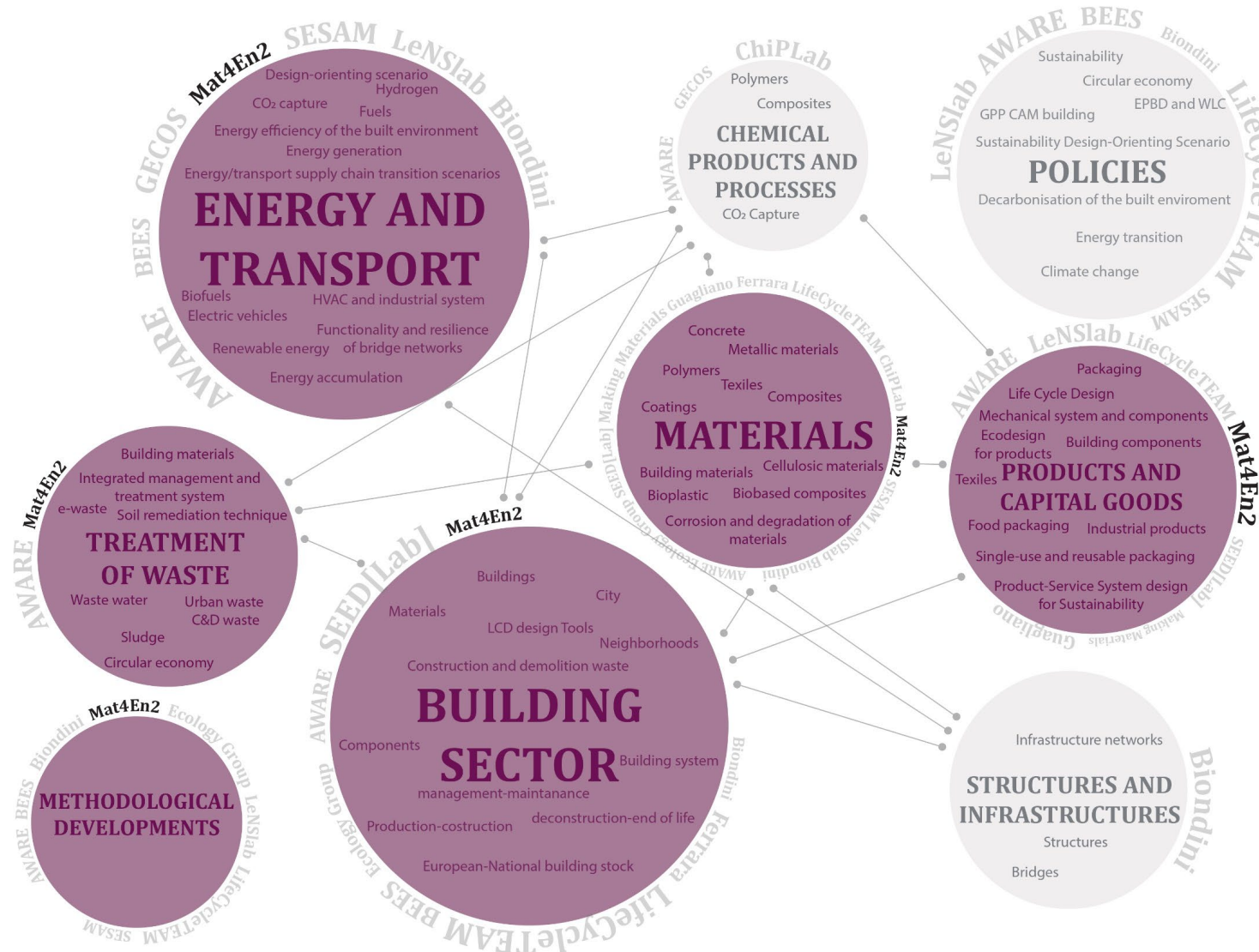


Main fields of LCA application

- LCA applied to **single-use** polymeric, cellulosic and **reusable food packaging** - R3PACK Horizon Eu project
- LCA applied to small **household appliances and protective packaging** to support **Life Cycle Design** activities - Smeg
- Drafting of an **ecodesign manual** for the design of **packaging for small household appliances** - Smeg



Mat4En2 – Materials for Energy and Environment (DCMC)



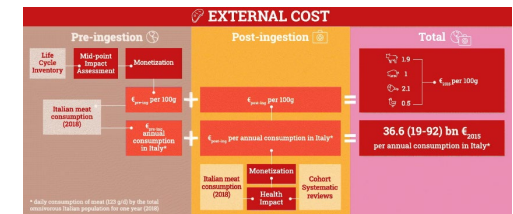
Mat4En2 – Materials for Energy and Environment (DCMC)

Proff. Giovanni Dotelli and Paola Gallo Stampino

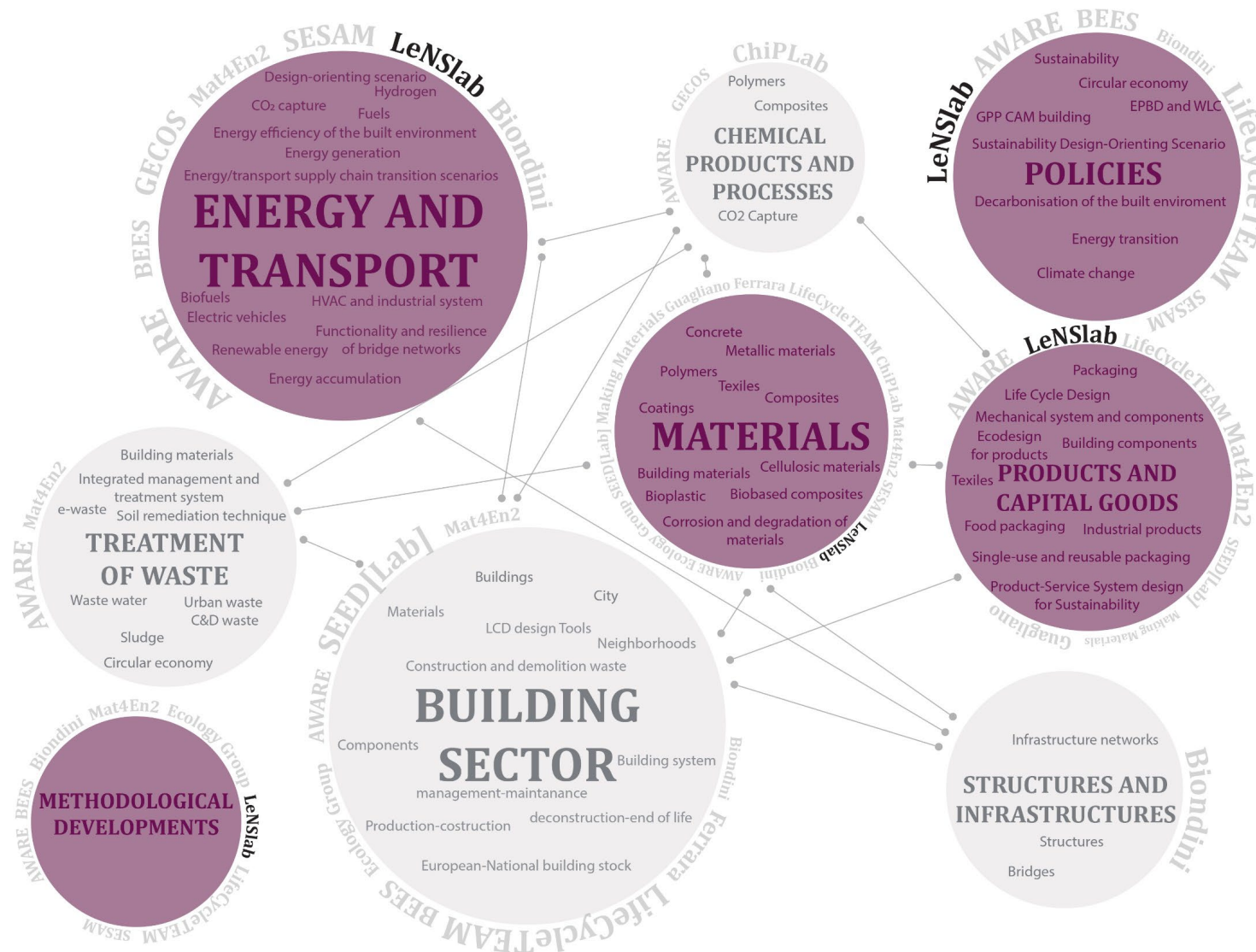
7 PhD students, 3 collaborators - <https://mat4en2.cmic.polimi.it>

Main fields of LCA application

- E-LCA applied to materials and production processes in various sectors such as:
 - a) energy storage and production from alternative sources;
 - b) food and beverage packaging;
 - c) sustainable mobility;
 - d) sustainable building
- Methodological developments of LCA in various area:
 - a) consequential LCA;
 - b) prospective LCA;
 - c) integration of LCA and Chemical Industrial Processing Simulation;
 - d) circularity Indicators and LCA
- Environmental labels (EPD and PEF) and calculation of CO₂-equivalent offsets



LeNSlab (DESIGN)



LeNSlab (DESIGN)

Know more →

Professors

Carlo Vezzoli
Francesco Scullica
Giovanni Conti
Fiammetta Costa
Andrea Ratti
Maurizio Bruglieri
Daniele Tamborini

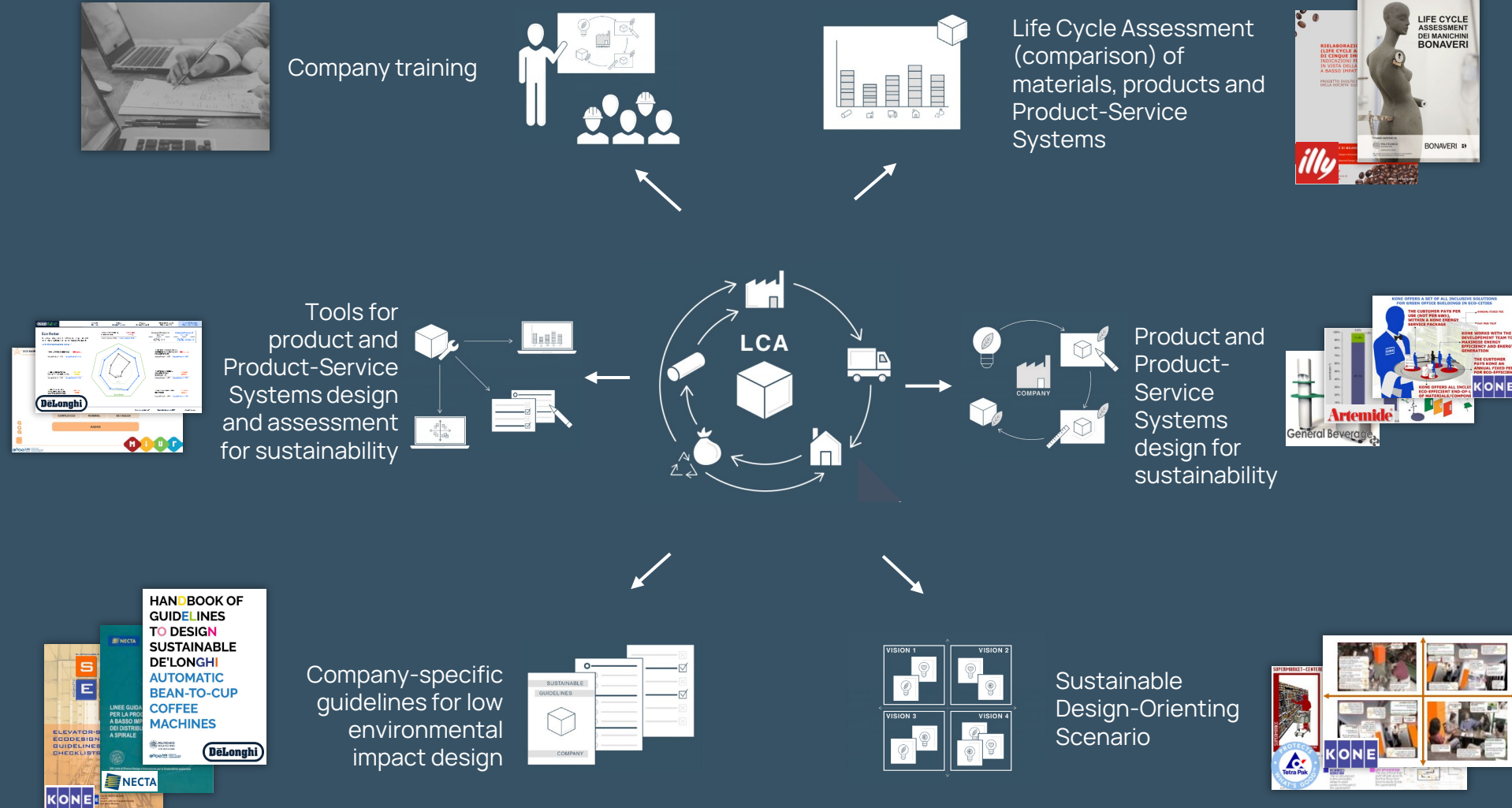
Researchers/technicians

Arianna Bionda
Elena Elgani
Martina Motta
Attilio Nebuloni
Carlo Proserpio

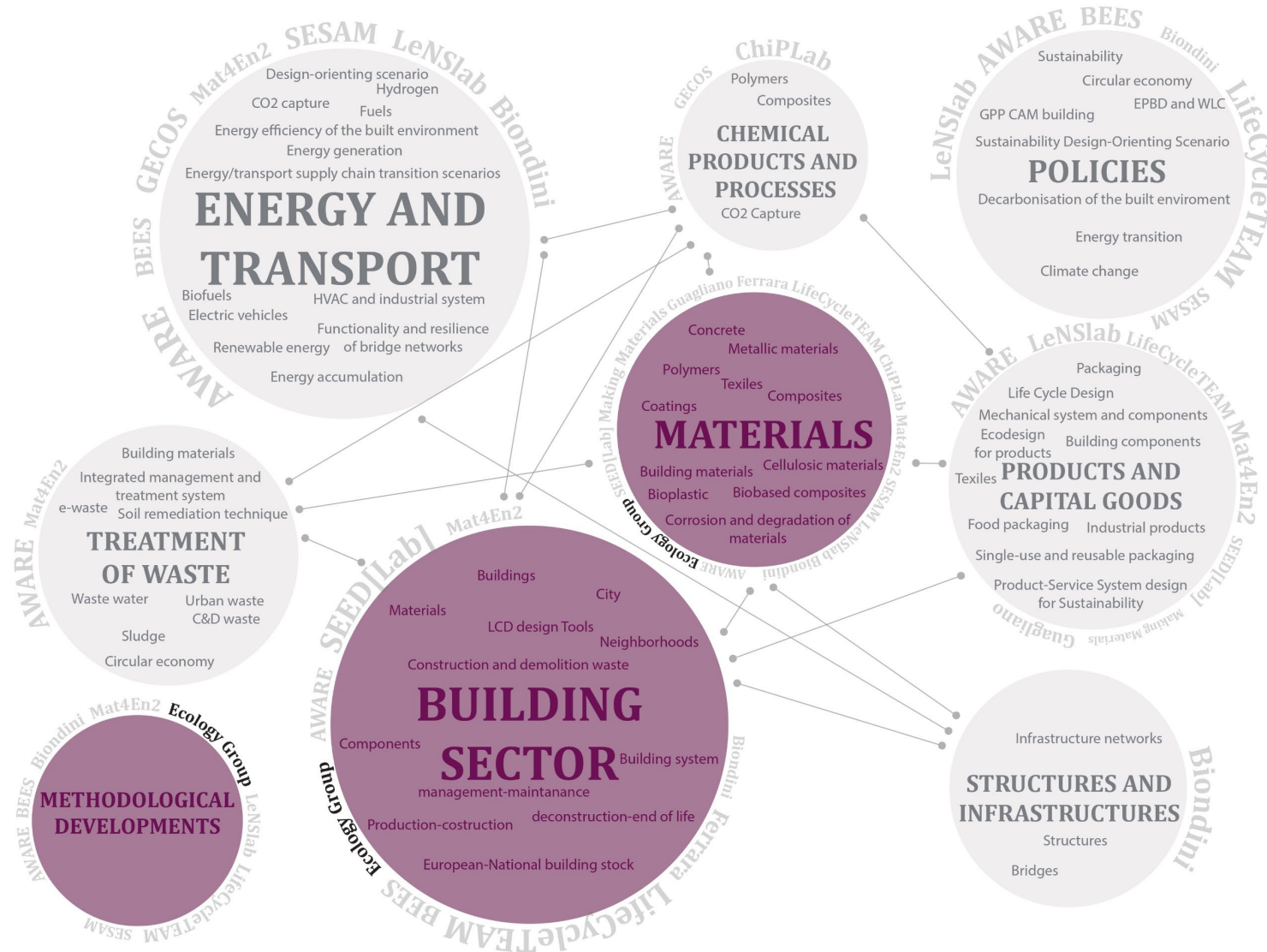
PhD students

Alessandra Petrecca
Gabriele Tempesta
Ludovico Ruggiero
Hang Su

Main fields of LCA application



Ecology Group (DEIB)

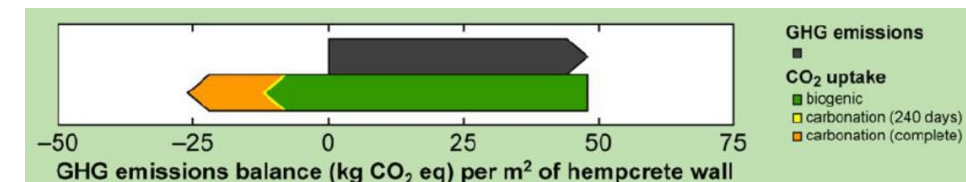
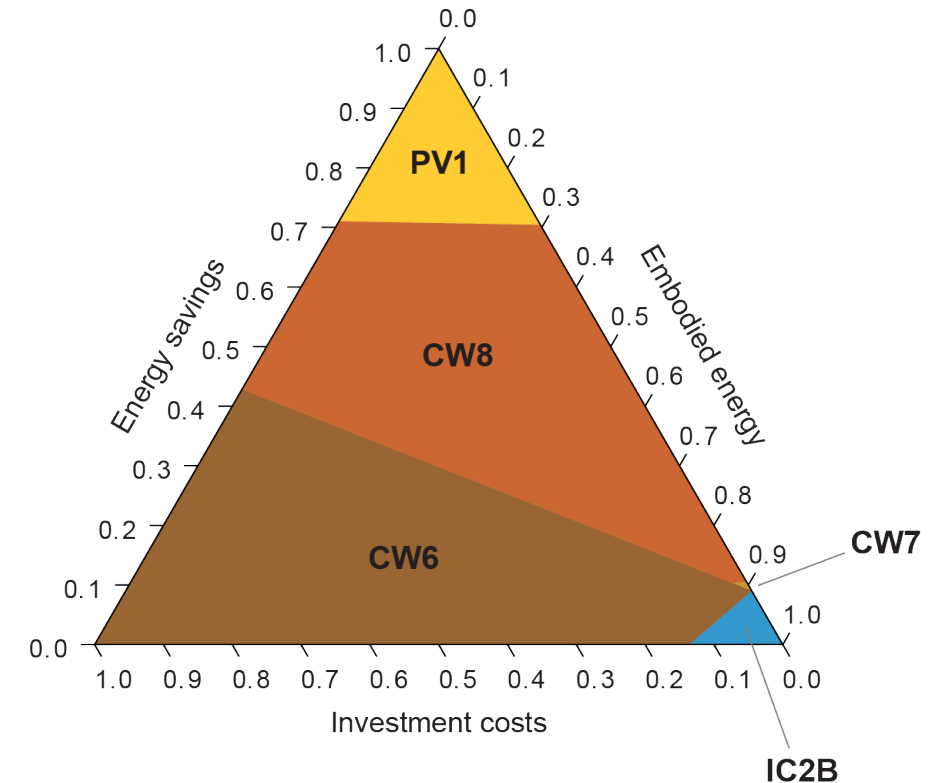


Ecology Group (DEIB)

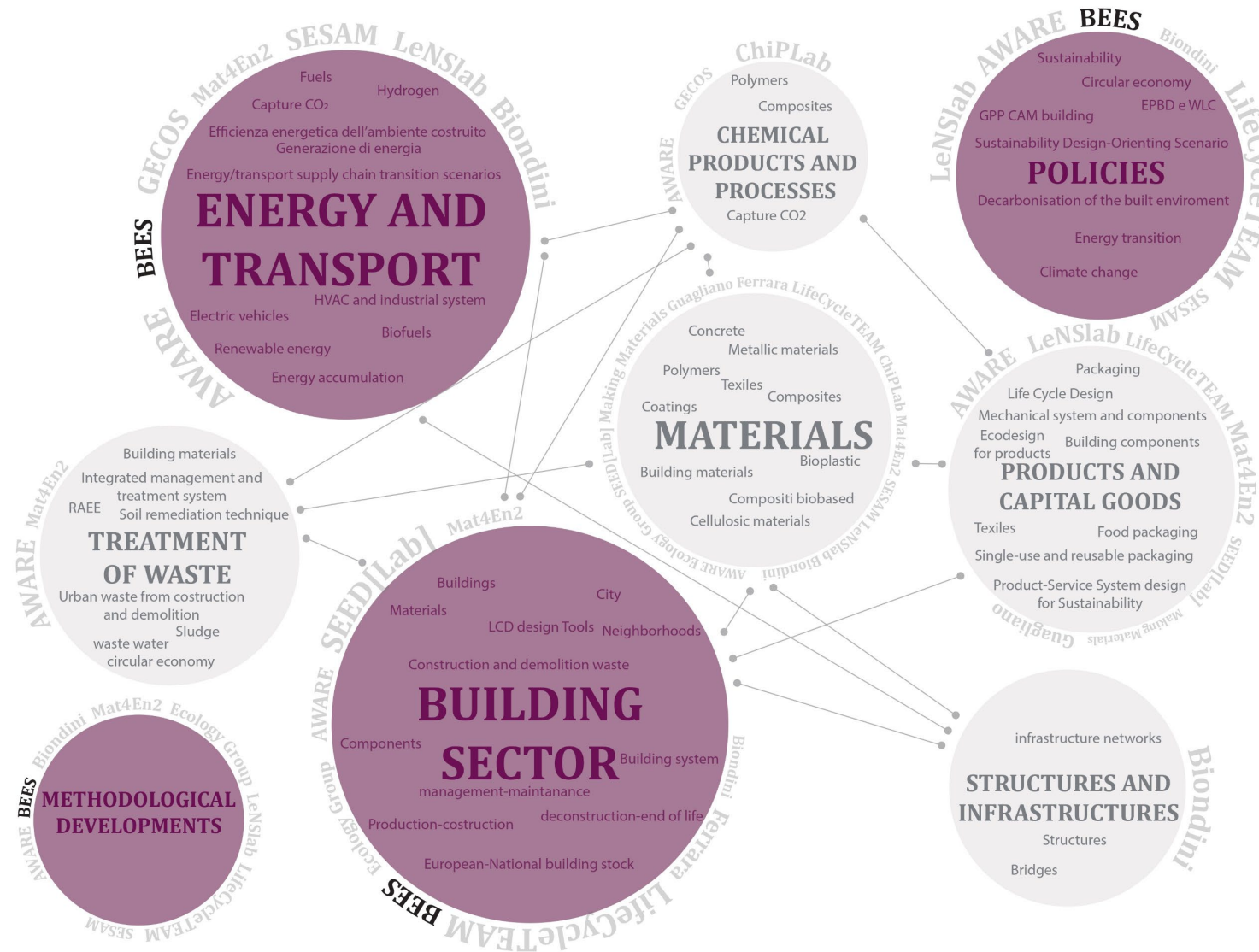
Proff. Paco Melià, Renato Casagrandi, and Lorenzo Mari; RTD Javier Babi Almenar

Main fields of LCA application

- Methodological aspects related to:
 - a. selection of environmental impact indicators for LCA (natural building materials, agro-food sector, ICT);
 - b. assessment of the environmental impacts of production processes on ecosystem processes and services;
 - c. finding trade-offs between different environmental impacts and between environmental, economic and social impacts



BEES - Buildings' Environment and Energy Systems (DENG)



BEES - Buildings' Environment and Energy Systems (DENG)

Prof. Francesco Causone and Dr. Jacopo Famiglietti

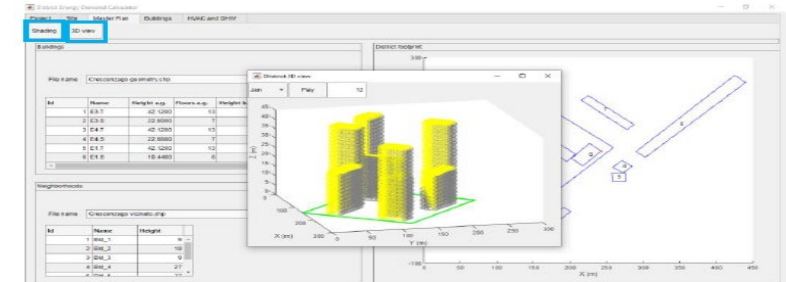
<https://www.relab.polimi.it/it/>



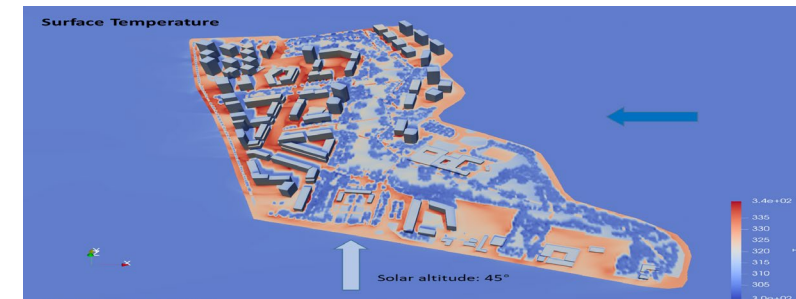
Main fields of LCA application

- LCA applied to HVACR systems - Heating, Ventilation, Air Conditioning, and Refrigeration
- LCA applied at the scale of building, districts, and city (i.e., multiple districts), thanks to tools (App - application programs) developed by the research group for dynamic simulation of energy demand, evaluation of benefits related to green infrastructure, and environmental profile assessment
- LCA as a tool to support the development of decarbonization policies of energy transition and the built environment (again thanks to Apps, e.g., mapping of district heating development potential)
- LCA software development
- Methodological developments in LCA

(a) Dynamic energy simulation



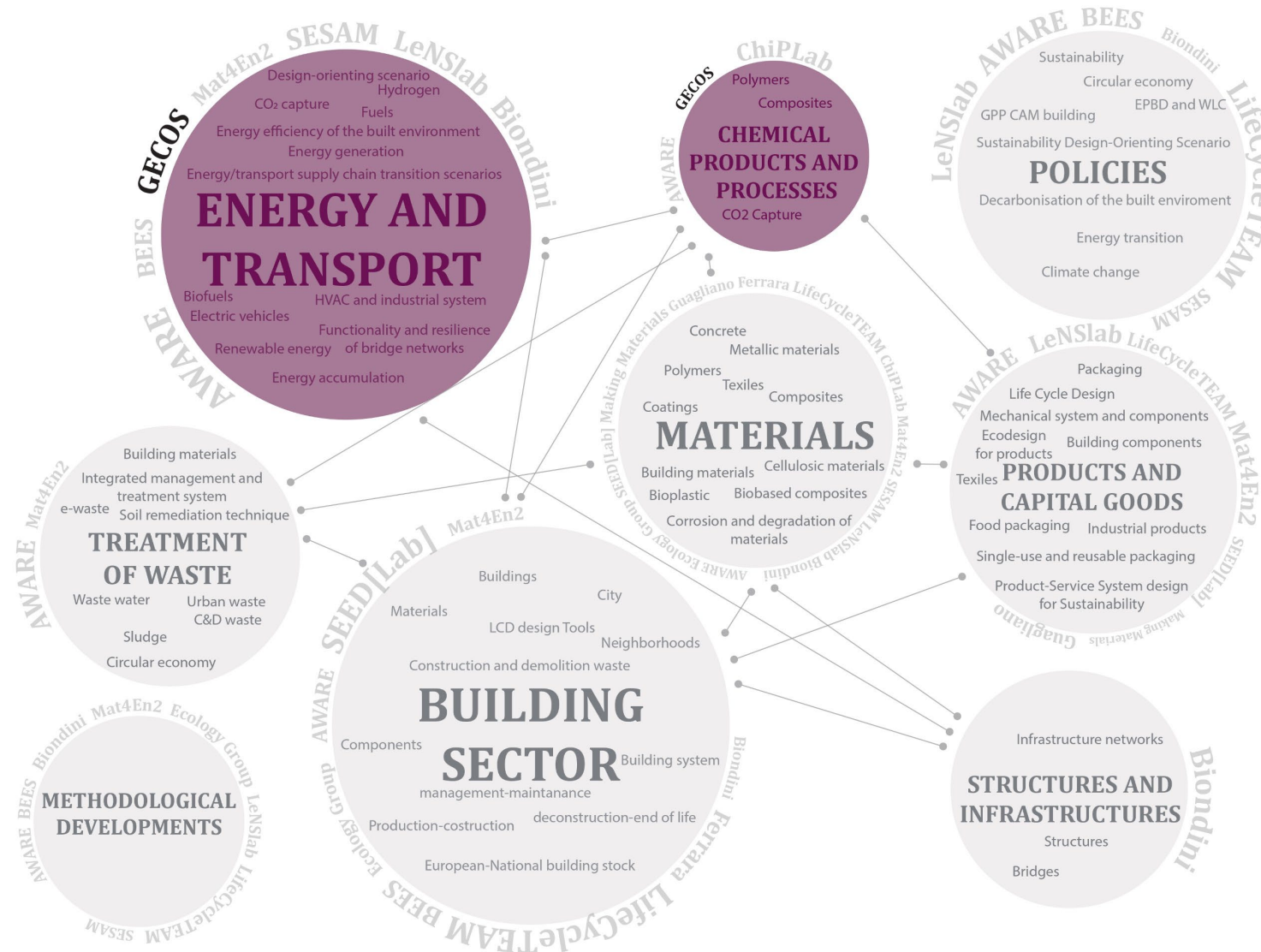
(b) Benefit from green infrastructure



(c) LCA software



GECOS – Group of Energy Conversion Systems (DENG)



GECOS – Group of Energy Conversion Systems (DENG)

Prof. Davide Bonalumi, Dr. Caecilia Vitasari, Eng. Mehrshad Kolahchian Tabrizi, and Eng. Paolo Perico

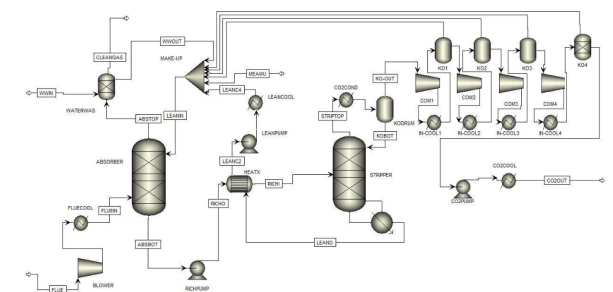
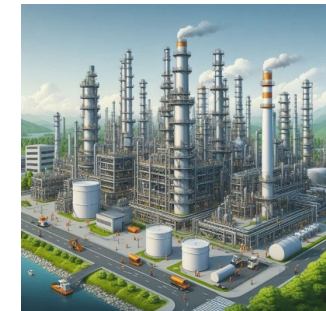
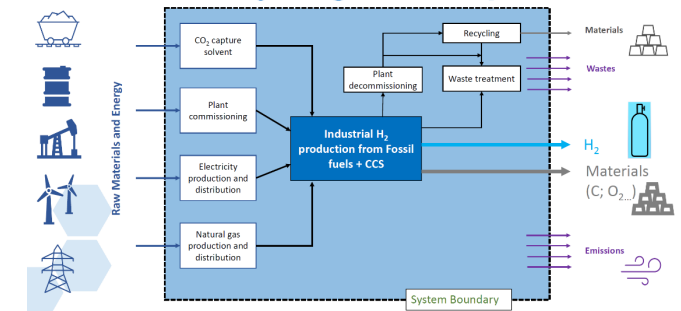
www.gecos.polimi.it



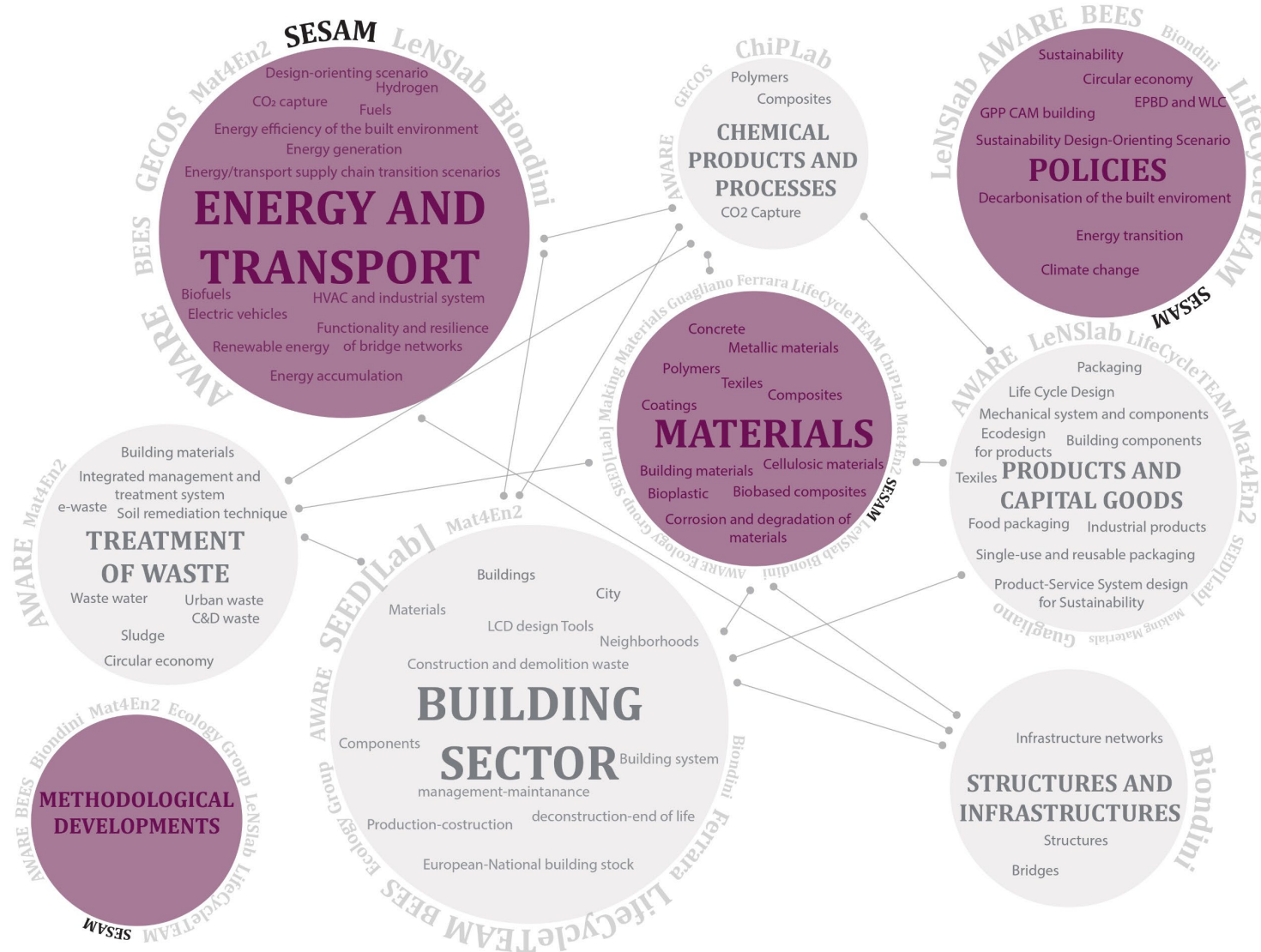
Main fields of LCA application

- LCA and Carbon Footprint (CFP) applied to industrial and energy processes
- LCA for energy carrier production (such as hydrogen, e-fuels...)
- LCA for fuels and integration with mobility
- Determination of CFP for processes, products, business sites, and company
- LCA and CFP in the development or design phase, integration with process simulations for techno-economic-environmental optimization
- Customization of processes, updating of adopted values from database according to actual production situation

LCA – Blue hydrogen example



SESAM (DENG)



SESAM (DENG)

Prof. Matteo V. Rocco and Prof. Emanuela Colombo

Main fields of LCA application

Multi-scale and integrated systems modelling

Industrial Ecology, Impact Assessment, LCA

- Theoretical developments: Input-Output LCA models
- Quantitative impact assessment

Scenarios of structural changes in national economic systems

LCA of energy-related products and activities

- Technology transfer → eNextGen

Company carbon footprinting (CSRD)

- Software development

MARIO – Multifunctional Analysis of Regions through Input-Output

PyESM – Input-output general purpose system modelling framework

Interactive dashboards – data engineering



Find us:



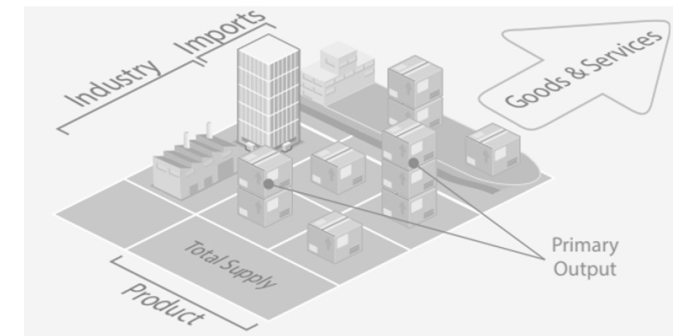
[Polimi](#)



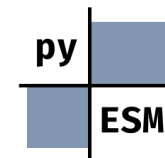
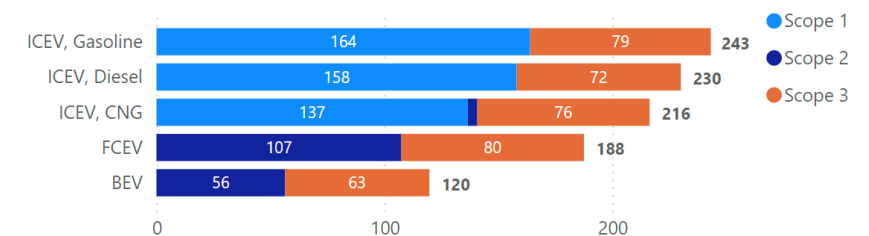
[LinkedIn](#)



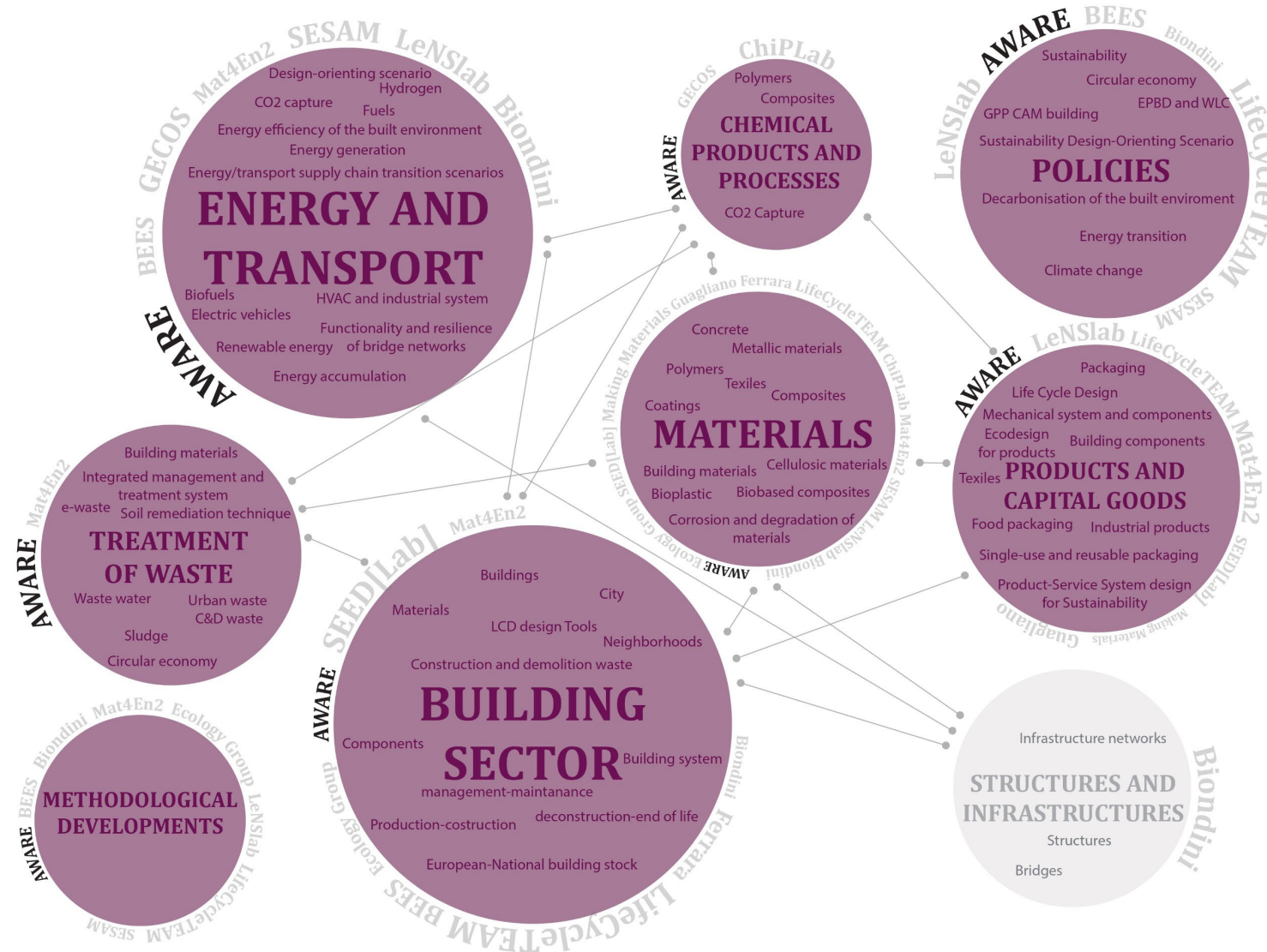
[GitHub](#)



Light Duty vehicles LCA emissions (gCO₂/km)



AWARE – Assessment on Waste and REsources (DICA)



AWARE – Assessment on WAstE and REsources (DICA)

Proff. Lucia Rigamonti, Mario Grosso, RTD Giovanni Dolci, 2 post-doc researchers, 4 PhD students, 4 research fellows, and 1 collaborator - <https://www.aware.polimi.it/>

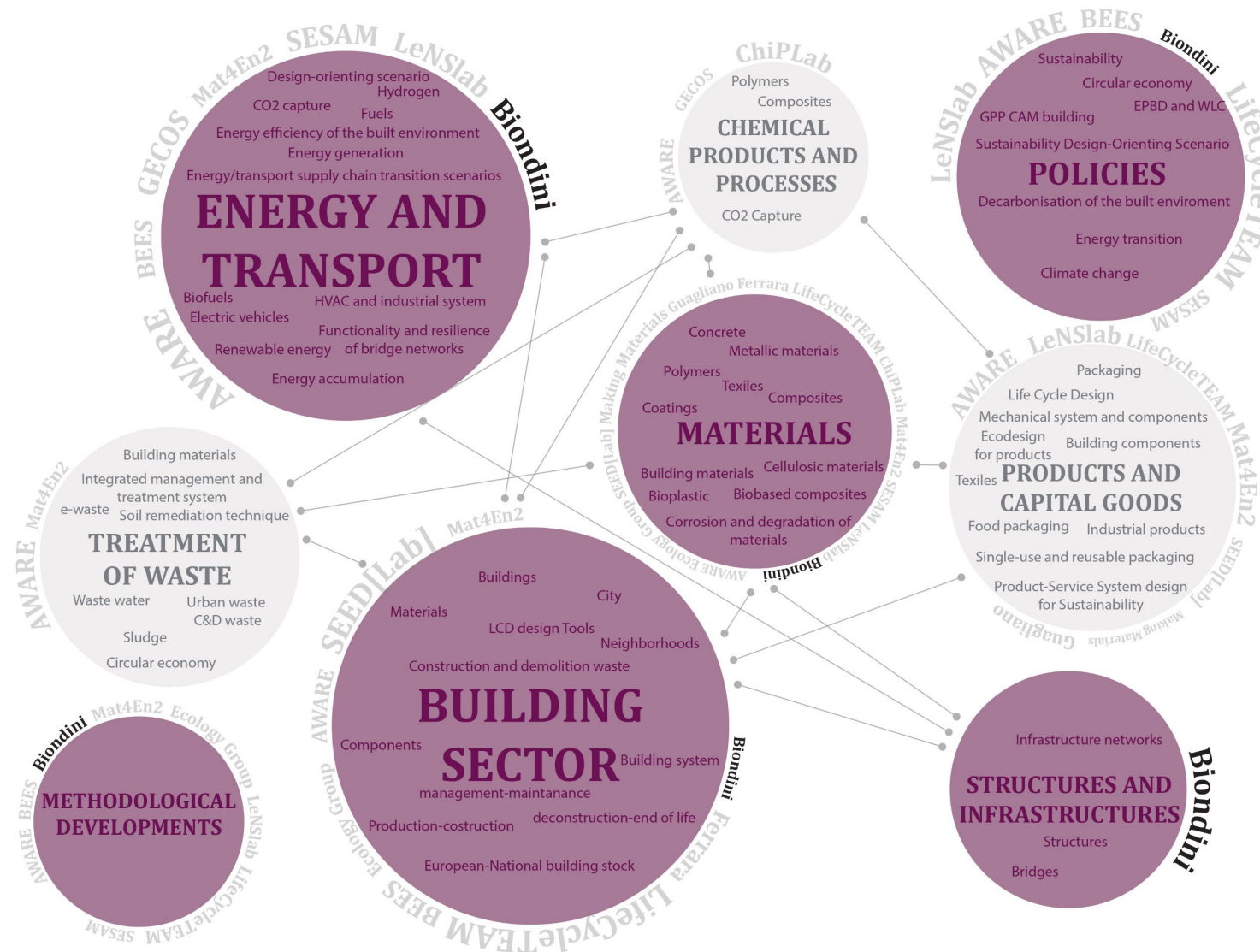


Main fields of LCA application

- LCA and LCC applied to waste treatment technologies, integrated waste management systems, waste prevention and circular economy strategies
- LCA applied to soil remediation technologies and water treatment plants
- LCA applied to evaluate alternative consumption choices (e.g. packaging)
- LCA for decarbonisation (renewable energy, electric vehicles, biofuels, e-fuels, hydrogen, and CO₂ capture technologies)
- LCA of carbon capture and utilisation
- Carbon Footprint of organisations
- Methodological developments in LCA and LCSA (Life Cycle Sustainability Assessment)
- Social LCA: methodological developments and application to the waste management sector



Fabio Biondini's Research Group(DICA) | IALCCE@Polimi



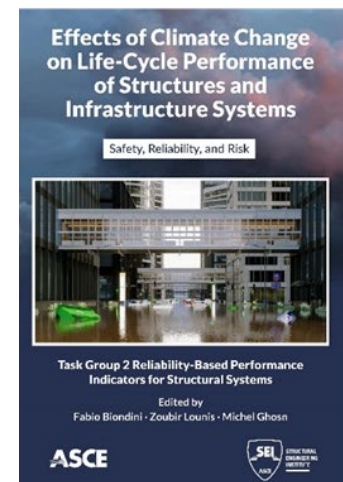
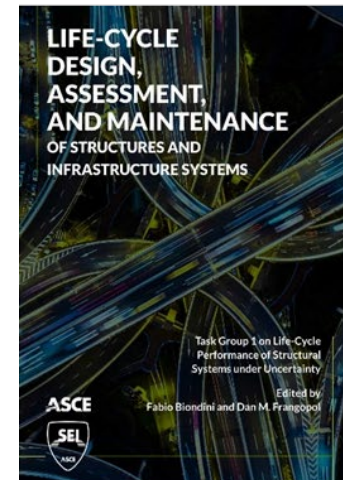
Fabio Biondini's Research Group(DICA) | IALCCE@Polimi

Prof. Fabio Biondini – <https://biondini.faculty.polimi.it>

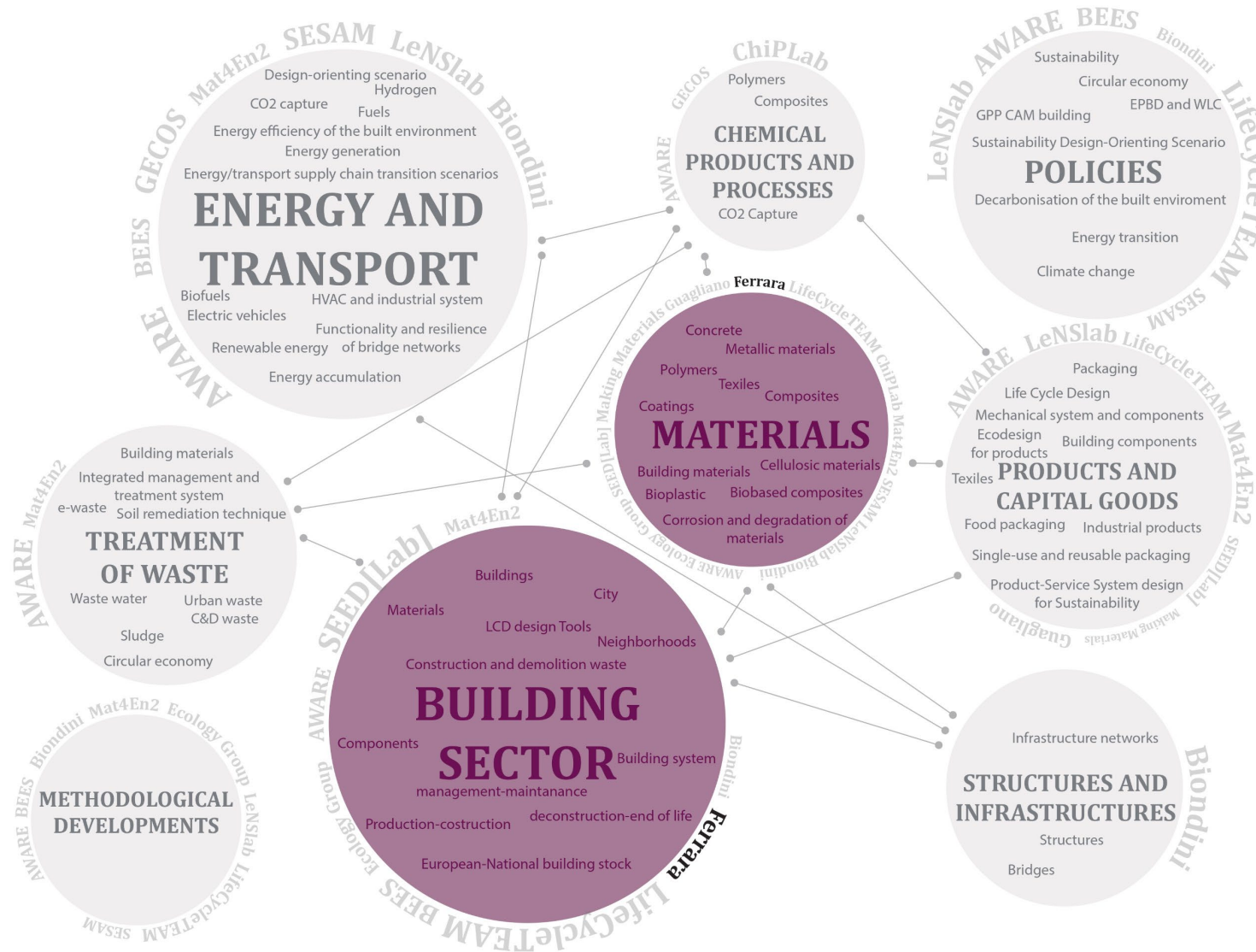
Post-doc: Mattia Anghileri, Rezan Choobdarian, Leila Jafari. **PhD Students:** Adriano D'lorio, Chihiro Yoshii, Sicong Xie, Enrique Ibarra, Zhibin Wang, Xihong Ning, Lorenzo Casti. **Research fellows:** Luca Rossi, Giuseppe Nava.

Main activities and fields of LCA application

- LCA/LCC research activities based on more than 20 years of experience in life-cycle design, assessment, maintenance, monitoring, and management of bridges and infrastructure systems exposed to aging and deterioration
- Formulation and experimental validation of methods for life-cycle analysis of risk, reliability, robustness, redundancy, resilience, and sustainability of structures and infrastructures, particularly bridges and bridge networks exposed to corrosion
- Effects of climate change on life-cycle of structures and infrastructure systems
- Application to a wide spectrum of structural engineering systems, including girder bridges, arch bridges, cable-stayed bridges, and landmark buildings
- Research projects and education programs on life-cycle of road/railway bridges and infrastructures funded by public authorities, professional organizations, and private companies: Superior Council of Public Works, Department of Civil Protection, Lombardy Region, Piedmont Region, ReLUIS, ASCE, SEI, ASPI, Tecne, Lombardi Engineering, Italferr, RFI, among others



Liberato Ferrara's Research Group (DICA)



Liberato Ferrara's Research Group (DICA)

Prof. Liberato Ferrara, PhD, PE

Post-doc: Davide di Summa, PhD, PE; PhD student: Marco Davolio, PE

Main fields of application

- **Durability Assessment-based Design (DAD)**

Design approach aimed at integrating LCA and LCC methodologies with related analysis of performance, durability and natural degradation of materials depending on specific exposure conditions

- **LCA within the construction sector**

Analyses on different scales, from material to large-scale case studies, and experience creating mock-ups for data collection on mechanical and durability properties

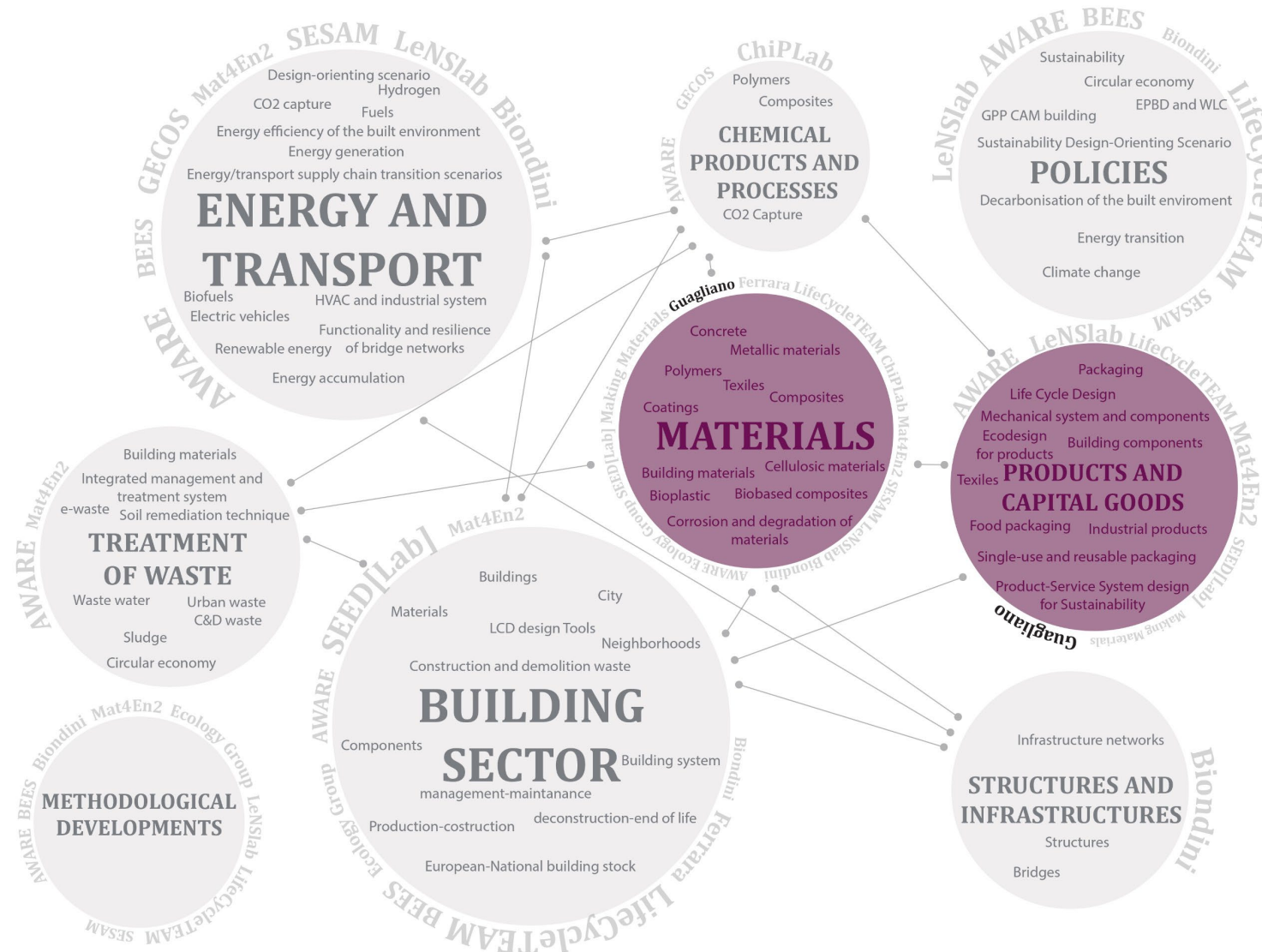
- **LCA for innovative materials and constituents**

Concrete with Super-Absorbent Polymers (SAP), Ultra High Performance Concrete (UHPC), concrete with NORM (Naturally Occurring Radioactive Materials), cellulose nano-crystals, microcapsules for self-healing, recycled aggregates for UHPC

Related projects



Mario Guagliano's Research Group (DMEC)



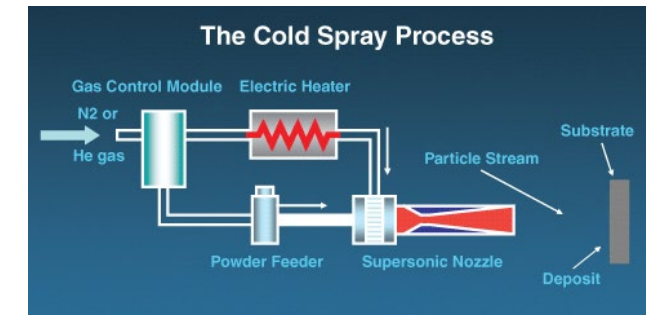
Mario Guagliano's Research Group (DMEC)

Prof. Mario Guagliano, Prof. Sara Bagherifard, 2 junior researcher, 2 post-doc, 15 PhD students

Main fields of LCA application

- LCA applied to the engineering design of mechanical systems and components
- LCA applied to the solid state additive manufacturing processes (cold spray)
- LCA for the choice of the surface processes and treatments for improving the mechanical strength (wear, fatigue, fretting,...) and for life extension of mechanical components
- Member of the **Circular Design in Mechanical Engineering** (CIDEM) Group of the Italian Scientific society of Mechanical and Machine Design

<https://www.aiasnet.it/circular-design-in-mechanical-engineering.html>





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Thank you for your attention

Contatti:

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