Politecnico di Torino | ScuDo Scuola di Dottorato - Doctoral School WHAT YOU ARE, TAKES YOU FAR

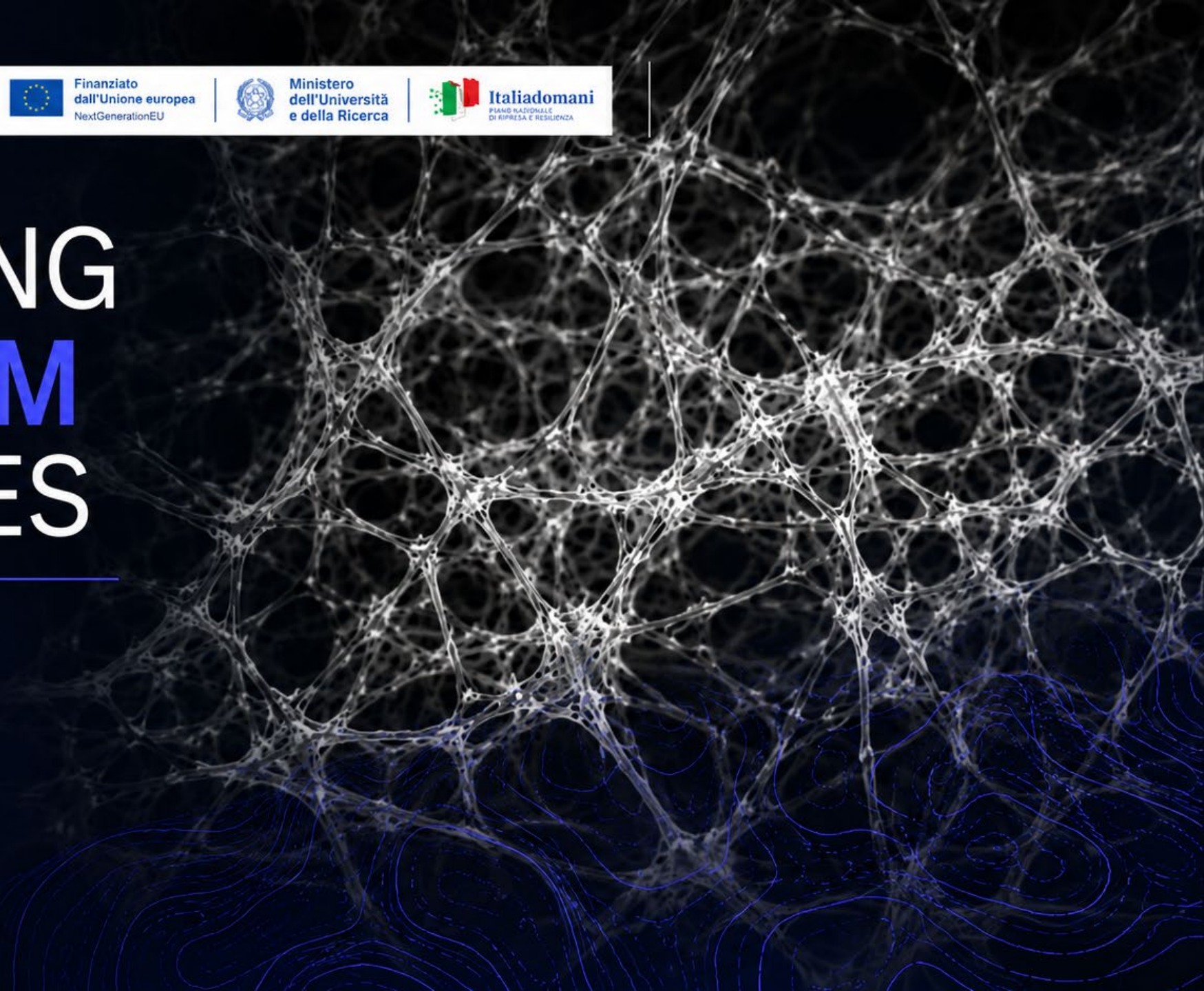
Finanziato dall'Unione europea NextGenerationEU | Ministero dell'Università e della Ricerca | Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

LOCALISING MYCELIUM PRACTICES

Adaptive bioregional design for the built environment

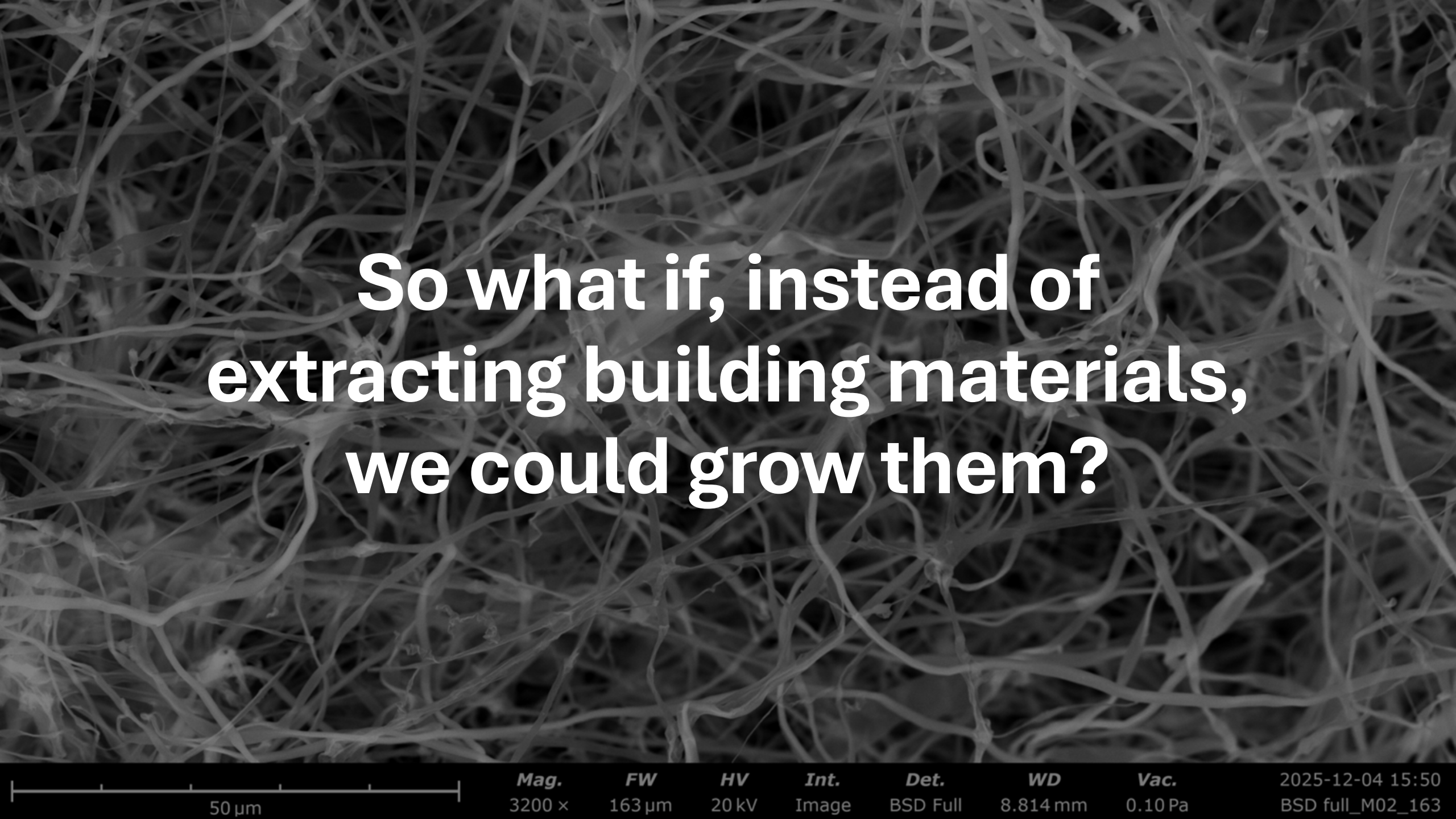
Fiamma Morselli
Politecnico di Torino

*From globalised material supply chains to **locally rooted** material systems.*



Local materials | Climatic adaptation | Craft knowledge | Regional construction cultures | Place based construction

Global supply chains | Standardized building envelopes | Universal performance metrics | Imported technologies


So what if, instead of extracting building materials, we could grow them?
50 µm
Mag. 3200 ×
FW 163 µm
HV 20 kV
Int. Image
Det. BSD Full
WD 8.814 mm
Vac. 0.10 Pa
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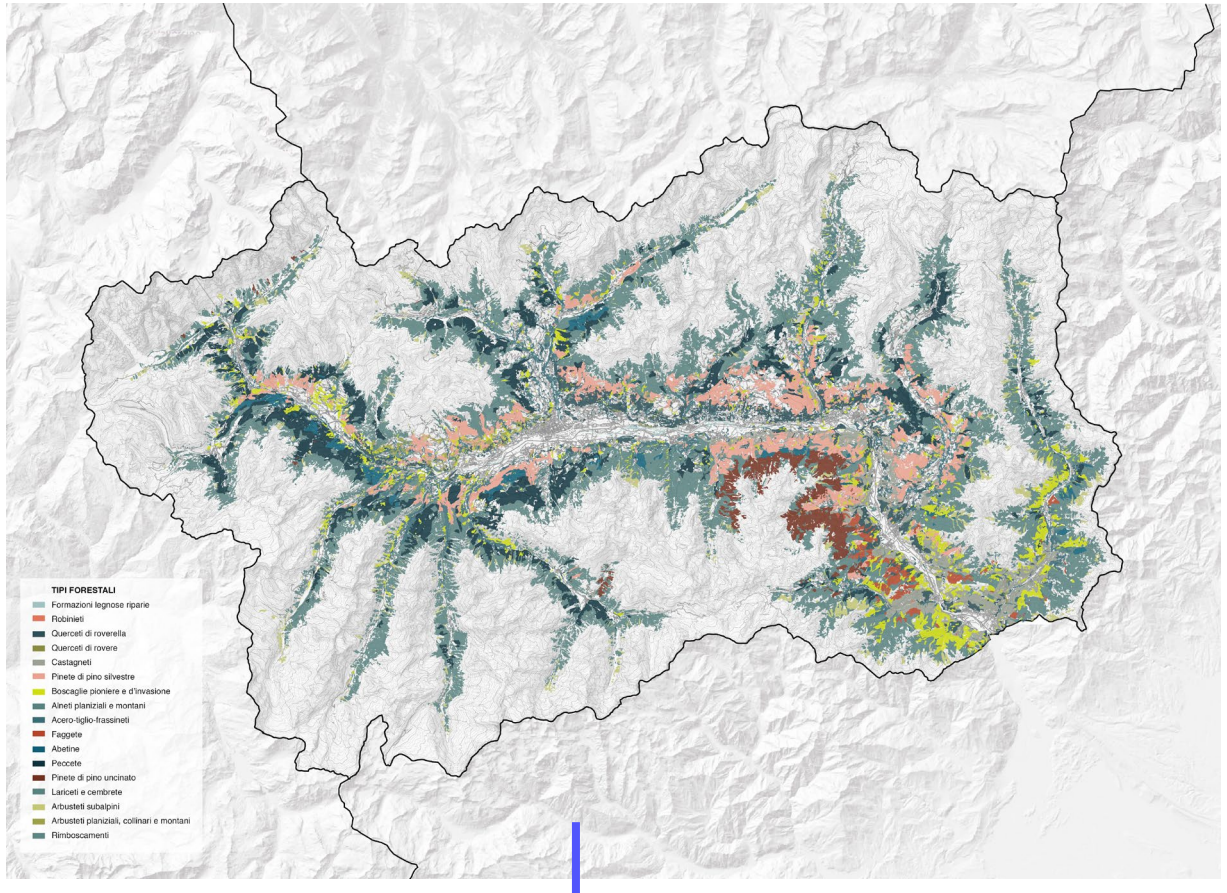
BSD full_M02_163

How can we develop mycelium materials that are rooted in local ecological conditions and local resources?



BIOREGIONAL DESIGN AND WORKFLOW OF MYCELIUM COMPOSITES

Case study: Valle d'Aosta, Italy

An adaptable workflow that transforms local biological resources into mycelium composite materials through bioregional knowledge and biofabrication.

1. LOCAL RESOURCE EXPLORATION

Mapping and selecting biological resources available in the bioregion.

01 FOREST SAMPLING

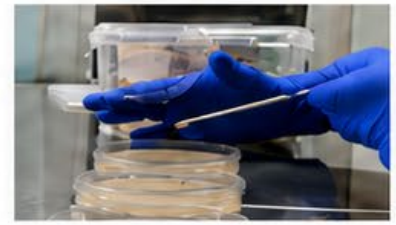
Fruiting body identification in alpine forest.

02 SPECIMEN COLLECTION

Tissue sampling.

03 STERILE TISSUE ISOLATION

Tissue isolation on agar medium in petri dishes in sterile conditions.



04 MYCELIAL CULTIVATION

Isolated tissue cultured on agar medium to promote mycelial growth.

BIOREGIONAL INPUT

Local biodiversity, climate, altitude and seasonal conditions guide fungal selection and cultivation strategies.

2. MYCELIUM PRODUCTION AND MATERIAL PREPARATION

Cultivating mycelium on local substrates to create the composite material.

05 MYCELIUM ISOLATION

Mycelial growth from tissue fragments on agar medium.

06 GRAIN SPAWN PREP

Mycelial culture transferred to sterile local grain substrate under sterile conditions.

07 MYCELIAL COLONISATION

Mycelial growth on grains.

08 INCUBATION

Grain spawn incubation for mycelial growth.

09 COMPOSITE MATERIAL

Development of composite materials with local substrates and local mushroom strains.

BIOFABRICATION PRINCIPLES

- Use local substrates
- Low energy processes
- Closed-loop systems
- Minimise waste
- Regenerative by design

3. MATERIAL SHAPING AND CURING

Shaping the colonised material and applying low-energy curing processes to stabilise and dry.

10 MOLDING

Place colonised material into desired mould.

11 SECONDARY COLONISATION

Further colonisation in mould to ensure structural integration.

12 DRYING & DEACTIVATION

Oven drying at 60 °C and post-deactivation to stop further fungal activity.

13 FINISHED MATERIAL

Biocomposite panel ready for use in building applications.

APPLICATION POTENTIAL

Panels, cladding, insulation, partitions and other non-structural building elements.

BIOREGIONAL DESIGN PRINCIPLES ACROSS THE WORKFLOW

LOCALLY ROOTED

Use local biological resources and knowledge.

CIRCULAR & REGENERATIVE

Return nutrients to the ecosystem and support local cycles.

ADAPTABLE & TRANSFERABLE

Workflow and recipes adaptable to other bioregions.

COMMUNITY & CONTEXT

Engage local stakeholders and respond to place-specific needs.

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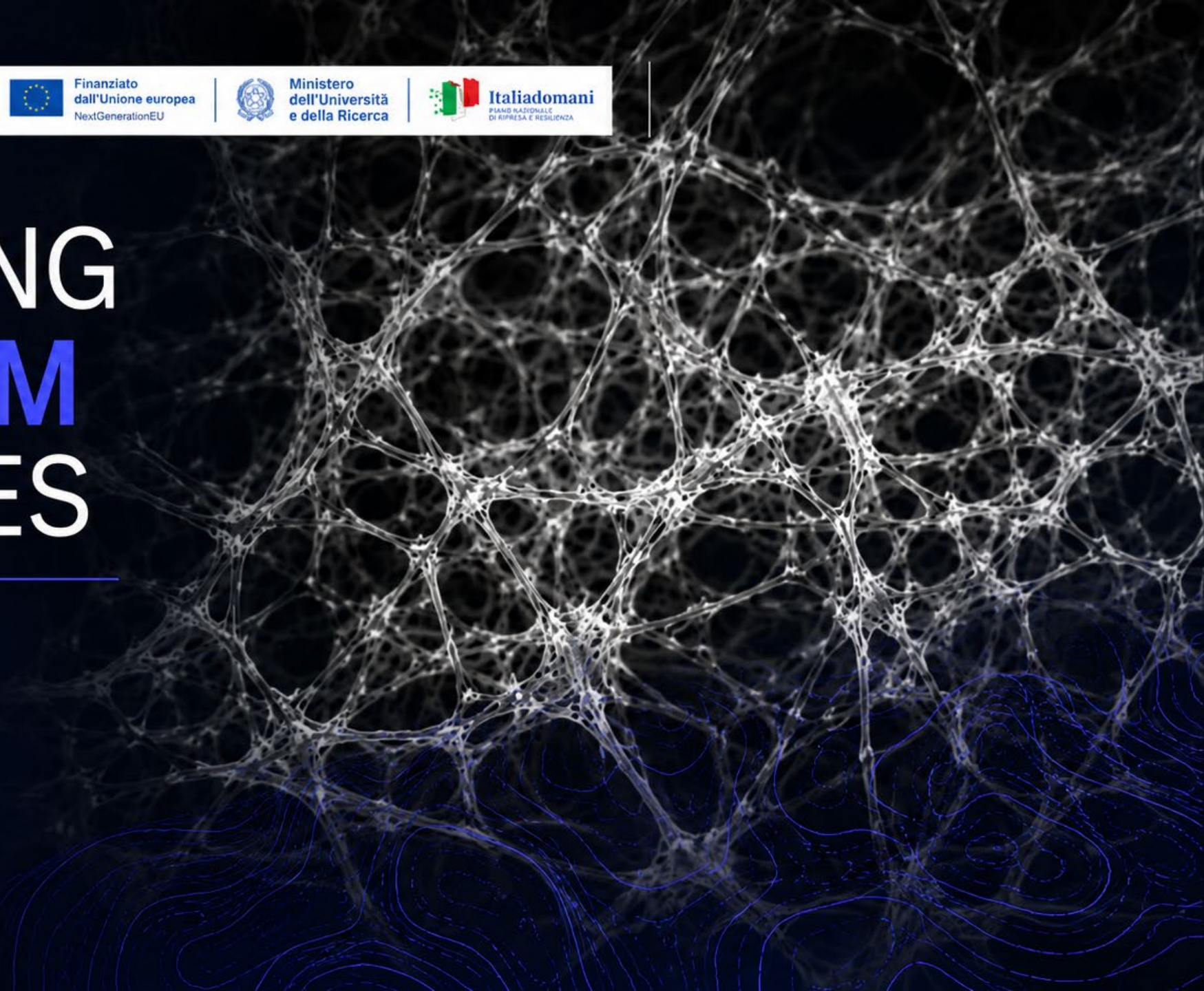
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