EXPANDFIBRE

Accelerating the development of sustainable bioproducts

fortum Metsä

What is ExpandFibre?

ExpandFibre (2020-2024) is a 50 M€ R&D collaboration and an Ecosystem launched by Fortum and Metsä Group and co-funded by Business Finland. It focuses on upgrading pulp fibre, hemicellulose and lignin from renewable and sustainable sources of straw and northern wood into new bioproducts. Its ambition is to meet the growing demands for sustainable textile fibres and other added value biomaterials.

The **research and development in ExpandFibre,** aiming at producing new ground-breaking technologies and smart business concepts, is divided into **seven research themes:**

- Textiles
- Biocomposites
- Packaging
- Lignin products
- Hemicellulose products
- Sourcing & fractionation of straw
- Other fibre products

ExpandFibre invites actors in these value chains to join in building a world-leading innovation ecosystem to eventually commercialize new bioproducts and green businesses

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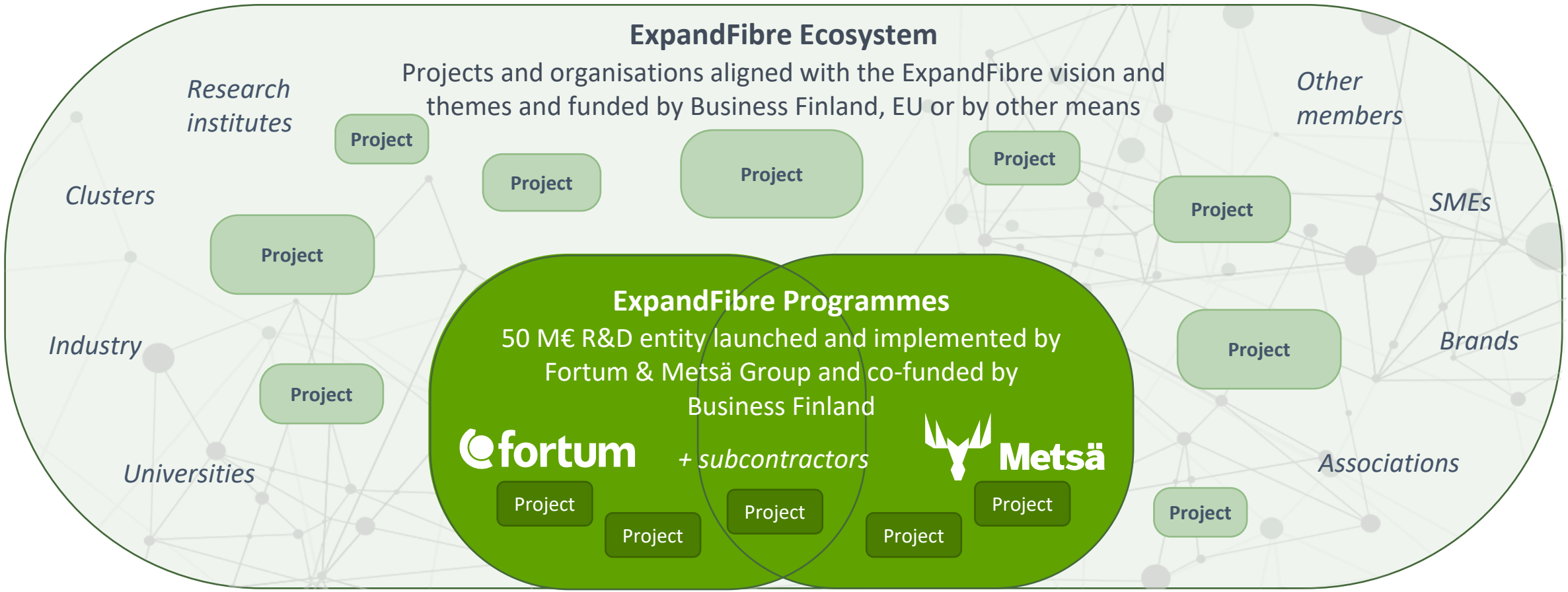
www expandfibre.com ExpandFibre

ExpandFibre Programmes & Ecosystem

Ecosystem Steering Group



ExpandFibre Ecosystem aims at developing novel bioproducts with a reduced environmental impact

Vision	**New bioproducts based on sustainable biomass contribute significantly to the reduction of the negative environmental impact of our everyday lives**
Mission	**ExpandFibre Ecosystem strives to meet the growing demand for sustainable bioproducts by developing ground-breaking materials and technologies and smart business concepts**

Short term objectives (2020-2024)

- Build knowledge-based **competitive advantage** among the ecosystem members
- Create/strengthen **test-beds for piloting** and proof-of-concept validations in the theme areas
- **Identify and fill in gaps** in the R&D landscape within ExpandFibre themes
- Create a thriving **business-driven innovation ecosystem for new biomass-based textile fibres**

Long-term objectives (2030 and beyond)

- Provide markets with new bioproducts that have **less than 20% of the carbon footprint** of the current products
- **Bring new revenue to ecosystem partners** through the increasing production and sale of new value-added bioproducts and technologies.
- Significantly **increase investments** into biomass-based value chains

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Fortum and Metsä Group aim to inspire a larger ecosystem to join the mission

ExpandFibre is built upon a strong partnership

- Both Fortum and Metsä Group have strategic targets to build new and sustainable biobased businesses of considerable scale
- Focus is on different raw materials (straw for Fortum, wood pulp for Metsä Group) but both companies have multiple complementing capabilities and solutions.

ExpandFibre Ecosystem complements the partnership

- The ExpandFibre Ecosystem, consisting of a multitude of bioeconomy players, has a central role in co-creating new technologies and concepts that complement the R&D efforts of Fortum and Metsä Group
- All projects in the Ecosystem are on the same mission

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ExpandFibre connects to multiple R&D initiatives by Fortum and Metsä Group

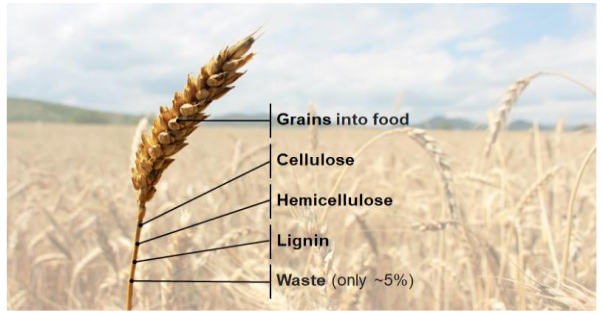
Collaboration with Chempolis and construction of the biorefinery in India (Fortum)

Demonstration of sustainable straw-based textiles (Fortum)

Development of novel materials utilising recycled plastics (Fortum)

Development of a new 3D wood-based packaging product to replace plastics (Metsä)

Sourcing & fractionation of straw	Lignin	Hemicellulose	Textiles	Biocomposites	Packaging	Other fibre products



High material efficiency through fractionation (Fortum)

Converting hemicellulose and lignin into value-added products (Fortum)

Development of sustainable textile fibre from paper-grade pulp (Metsä)

Establishment of Paperboard and Packaging Excellence Centre in Äänekoski (Metsä)

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ExpandFibre Ecosystem R&D&I focus points on the road towards the Vision 2030

Straw and wood fibres as raw materials

Textiles

- New, sustainable textile fibres for wearable textiles and nonwovens
- Staple fibre analytics and performance testing
- New staple fibre applications and post-treatment technologies
- Recycling and traceability
- Business models to speed up global market entries

Biocomposites

- Raw material processing and converting
- Material properties
- Recycling and end-of-life
- Biocomposites containing fibres and lignin
- All-cellulose composites & natural fibre polymer composites
- Additive chemistry

Packaging

- New pulp-based plastic-replacing packaging solutions
- Tools and processes for designing sustainable packaging
- Barriers and binders based on natural polymers

Lignin products*

- Lignin fractionation for material applications
- Lignin as functional ingredient for thermosetting resins as well as for thermoplastics and bio-composites
- Lignin dispersants
- Novel methods for lignin functionalization

*) Especially for straw

Hemicellulose products*

- Hemicellulosic sugar refining and separation
- Xylose, pentoses and furfural as industrial ingredients and platform chemicals
- Polymeric hemicellulose as industrial ingredients and platform chemicals

*) Especially for straw

Sourcing & fractionation of straw

- Sustainable agricultural residue supply chains
- Concepts for low-emission straw supply networks
- Novel biomass supply contract concepts
- New fractionation technologies for processing of agro-residual raw materials
- Side-stream utilization in animal feed and fertilizer applications

Other fibre products

- New materials based on pulp fibres for high-volume applications
- Novel chemistry for pulp fibre modification
- Functional structures including hybrid materials
- Advanced 3D and 4D fibre processing methods
- Fibre and specialty cellulose products from straw pulp, including MFC, MCC and chemically modified cellulose

Cross-cutting topics

- Replacing plastics and fossil-based materials
- Digitalisation & measuring
- Emerging technologies
- Sustainability assessment
- Design for circularity
- Piloting and test-beds for new applications
- Following regulatory environment

Vision for 2030

- **Investments** in commercial production of new bioproducts (textile fibres, biocomposites, other bioproducts, etc.)
- New bioproducts available to the markets with significantly **lower carbon footprint**
- Sales and/or out-licensing of **new technologies** related to new bioproducts
- **Professionals** trained for new bioproduct businesses
- **Sustainability awareness** increased throughout the value chains

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ExpandFibre ecosystem members*

**Note: Ecosystem members as of September 22nd 2021 – list continuously updated as new members join the Ecosystem*

Ecosystem projects*

Project name	Theme	Duration	Funding scheme	Partners
FinnFiberColor	Textiles	02/2021 - 01/2023	BF Research project	**Aalto**, Fortum, Metsä Spring, Andritz, UPM, Kemira, Stora Enso, Orneule, Jokipiin Pellava, Tam-Silk, Sidoste
LigninReSurf	Lignin, packaging	01/2021- 12/2023	BF Research project	**Åbo Akademi**, BOKU, IEM, CH Bioforce, St1, MetGen, Mirka, Kemira, 3D Tech
ValCel	Textiles, other fibre products	01/2021 - 12/2022	BF Co-innovation	**VTT**, Univ. of Helsinki, Univ. of Oulu, Kemira, Metsä Fibre, Metsä Spring, Brightplus, Liuotin Group, Pixact, TopAnalytica
SynBioPro	Textiles, lignin, hemicellulose	01/2021 - 12/2022	BF Research project	**VTT**, Tampere University, Fortum, Neste, Kemira, Mirka, Olfactomics
SynBio Powerhouse Ecosystem	Lignin, hemicelluloses	08/2018 -	BF growth engine	**VTT**, Growing synthetic biology ecosystem of current 1500 connections
EcoLabNet	Biocomposites, cross-cutting	01/2019 – 12/2021	Interreg Baltic Sea Region	**Centria**, VAMK, Kaunas Univ. of Technology, Univ. of Tartu, Czestochowa Univ. of Technology, VIA Univ. College, Vilnius Univ., Lithuanian Business Confederation, Labsamera MB, Estrotech Ltd
Future of Nonwovens (FoN)	Textiles	05/2021- 04/2023	BF Co-innovation	**VTT**, Fortum, Metsä Spring, Valmet Automation, UPM-Kymmene, Suominen, CH-Polymers, Anpap, Infinited Fiber Company

ValCel – Value for Cellulosics

FoN – Future of Nonwovens

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**Note: Ecosystem projects as of September 22nd 2021 – listing updated as new projects join the Ecosystem*

Why should you join the ecosystem?

The ExpandFibre Ecosystem is an opportunity to:

- Finding innovation and collaboration partners
- Finding new business opportunities
- Cross-discipline and end-to-end value chain cooperation
- Sharing thoughts and ideas with those who share the same vision for a sustainable future
- Connection to the Business Finland Veturi ecosystem funding scheme
- Being a part of a large-scale go-to-market vehicle

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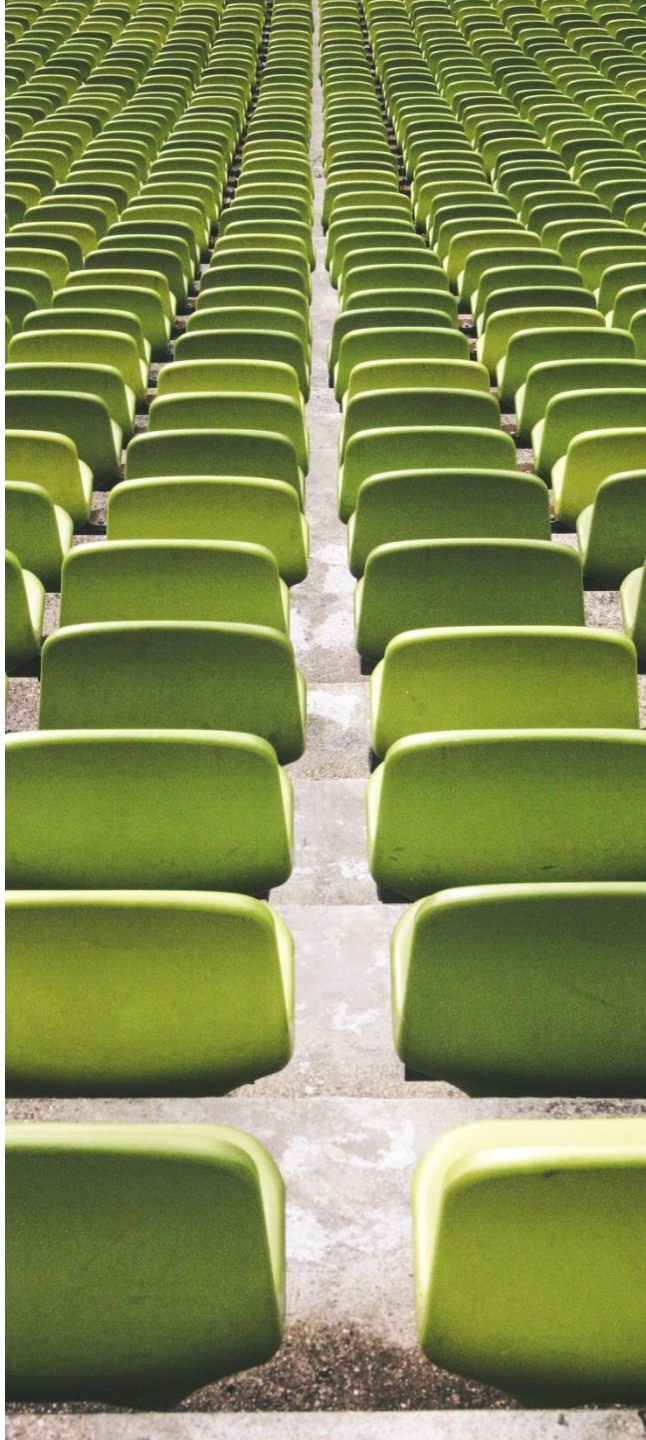

Why join? The ExpandFibre value proposition to non-Finnish members

The ExpandFibre Ecosystem is an opportunity to:

- Networking and collaborating with the Finnish innovation value chains
- Gaining overall visibility of and to the Finnish R&D landscape
- Cross-discipline and end-to-end value chain cooperation
- Better insights and connections to existing and upcoming project preparations between companies, and between companies and research institutes
- Sharing thoughts and ideas with those who share the same vision for a sustainable future
- Being a part of a large-scale go-to-market vehicle

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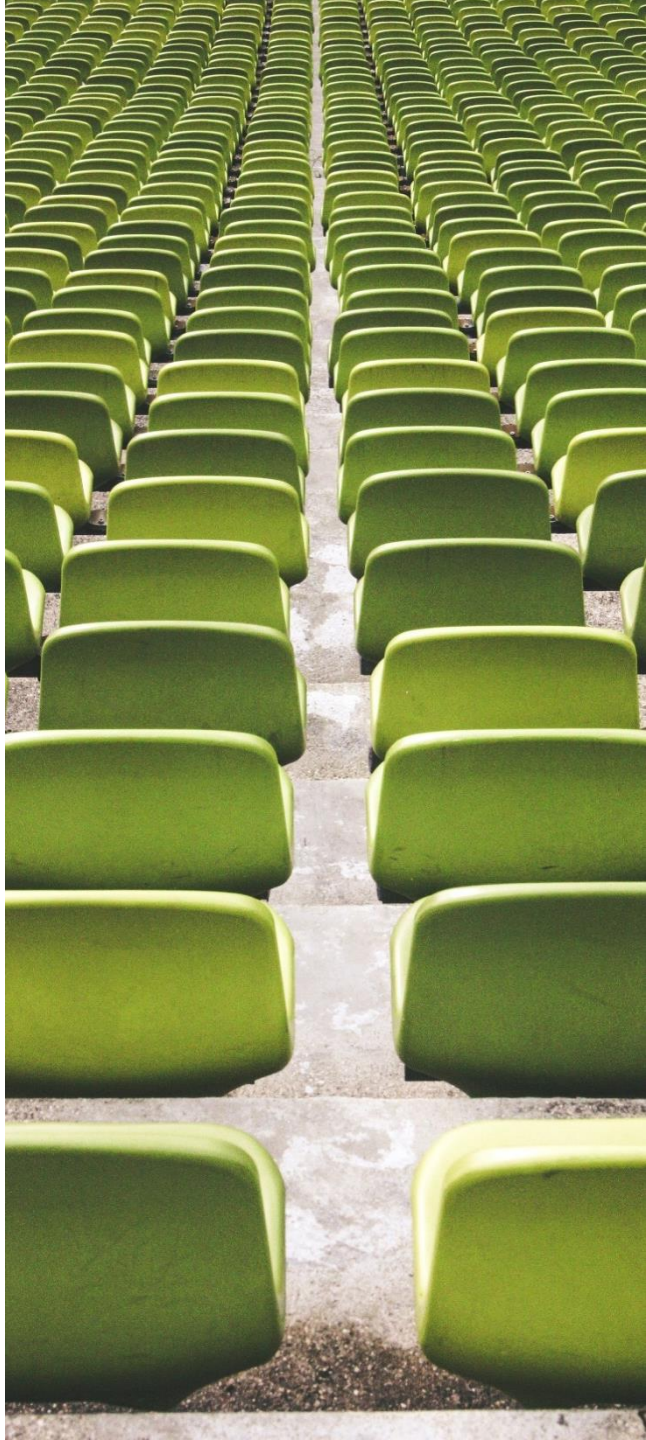

Why join? The ExpandFibre value proposition to projects

The ExpandFibre Ecosystem is an opportunity to:

- Increase the visibility of the project and its results via dissemination
- Validate project results through dedicated workshops
- Find partners to take project results to the market to speed up commercialisation
- Identify and create next projects and find partners for them
- Expand the project scope and find new materials/technologies/other solutions to test
- Exchange ideas with those who share the same vision for a sustainable future, and engage in cross-sectional collaboration

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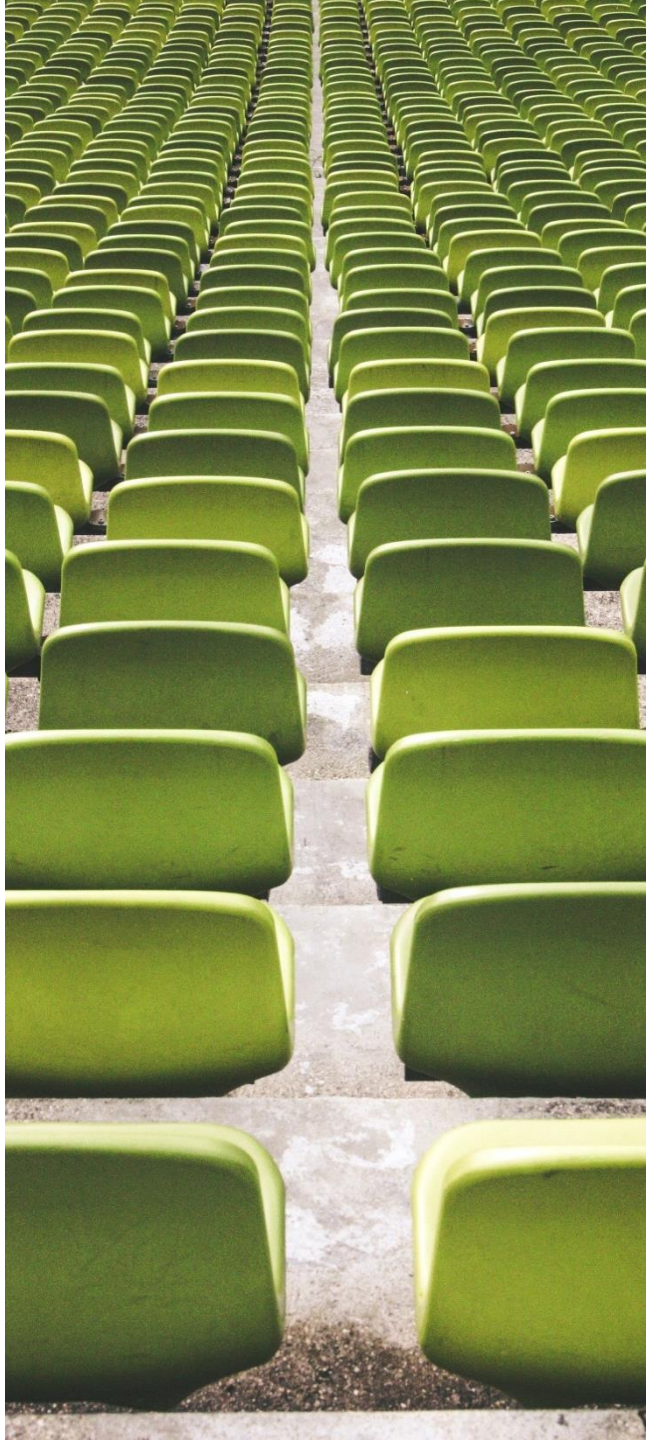

Membership of ExpandFibre Ecosystem

- As a principle, ExpandFibre Ecosystem welcomes organisations as well as existing projects and project applications as a part of the Ecosystem, if their **vision is in line with ExpandFibre vision** and if they work in the ExpandFibre Theme areas.
- By joining the Ecosystem you join a mailing list and give permission to use your organization's / project's name and logo on the ExpandFibre website and other similar communications materials.
- ExpandFibre will send a questionnaire to each member annually, asking for **certain public KPI's** to track the progress of the ecosystem.

ExpandFibre Programme Managers
(=ExpandFibre Management Group) manage all membership issues:

- **Fortum**

  Heli Virkki

  Senior Manager, Bio2X

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- **Metsä Group**

  Katariina Kemppainen,

  VP, Group R&D, Metsä Spring

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Process to join the Ecosystem

1. **Contact ExpandFibre Programme Managers** (by email or through the website contact form) to discuss and align common interests.
2. If interests are aligned, you will receive a link to an **online form** to provide information about your organisation or project.
3. ExpandFibre management decides on the approval and informs the member / project of the decision, and upon a positive decision collects their logo and adds them to the Ecosystem mailing list

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Ecosystem events & communication

- ExpandFibre targets to create awareness, facilitate match-making, identify gaps and initiate the preparation of new R&D projects.
- This takes place through:
  - Actively meeting with ecosystem members and creating new links between them
  - Arranging theme related workshops, ecosystem events and an annual seminar
  - Co-operating and coordinating work with other ecosystems
    - e.g. CLIC Innovation and its ecosystems (4Recycling), FinnCERES Materials Cluster & other Business Finland Veturi ecosystems

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Join us to meet the growing demand for sustainable bioproducts – we need players from every part of the value-chain

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