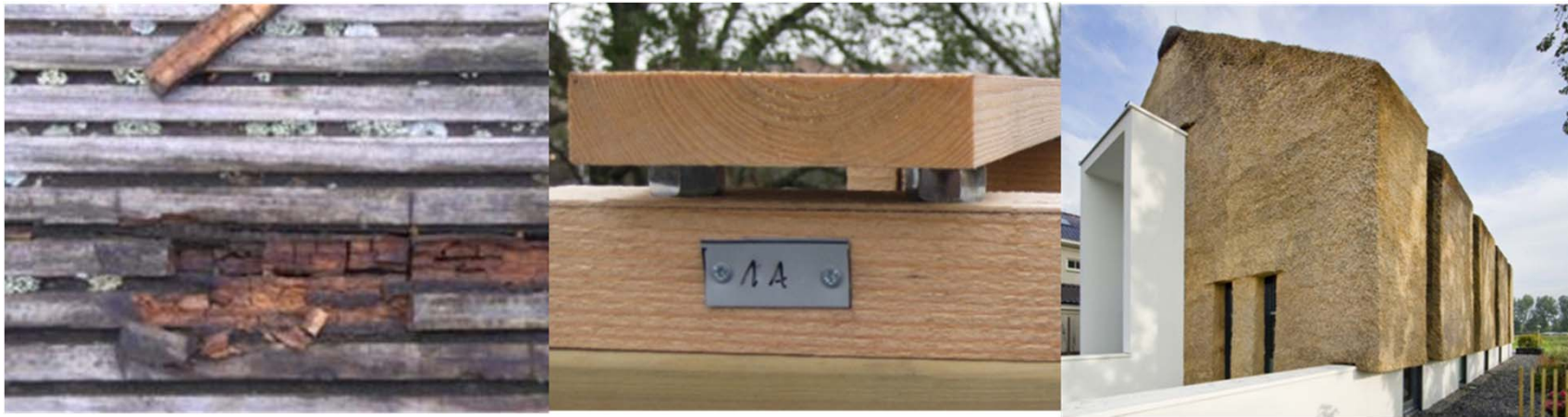


Ongoing R&D projects in COST member countries

January 2014



Finland





Participating Group 1, VTT Technical Research Centre of Finland

Hannu Viitanen, Elina Sohlberg, Kirsi Immonen,

Participating Group 2, Metla Finnish Forest Research Institute

Pekka Saranpää, Erkki Verkasalo, Martti Venäläinen

Participating Group 3, TUT, Tampere University of Technology TUT, Building Physics

Juha Vinha, Anssi Laukarinen

Participating Group 4, UEF, University of Eastern Finland,

Dep of Environmental Sciences, Indoor Environment and Occupational Health, **Pertti Pasanen**,

Department of applied physics, Biomater unit, Reijo Lappalainen

Participating Group 5, Aalto University, Wood Science & Technology

Mark Hughes, Lauri Rautkaari

Participating group 6, Finnish Association of Construction Product Industries RTT,

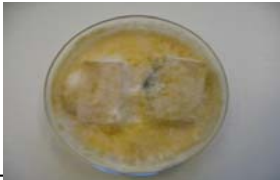
Wood Construction, **Tomi Toratti**



*Several research projects for industry for study the resistance of new solutions
Optimisation of durability against mould and decay, and service life of wood
Durability of bio-polymers*

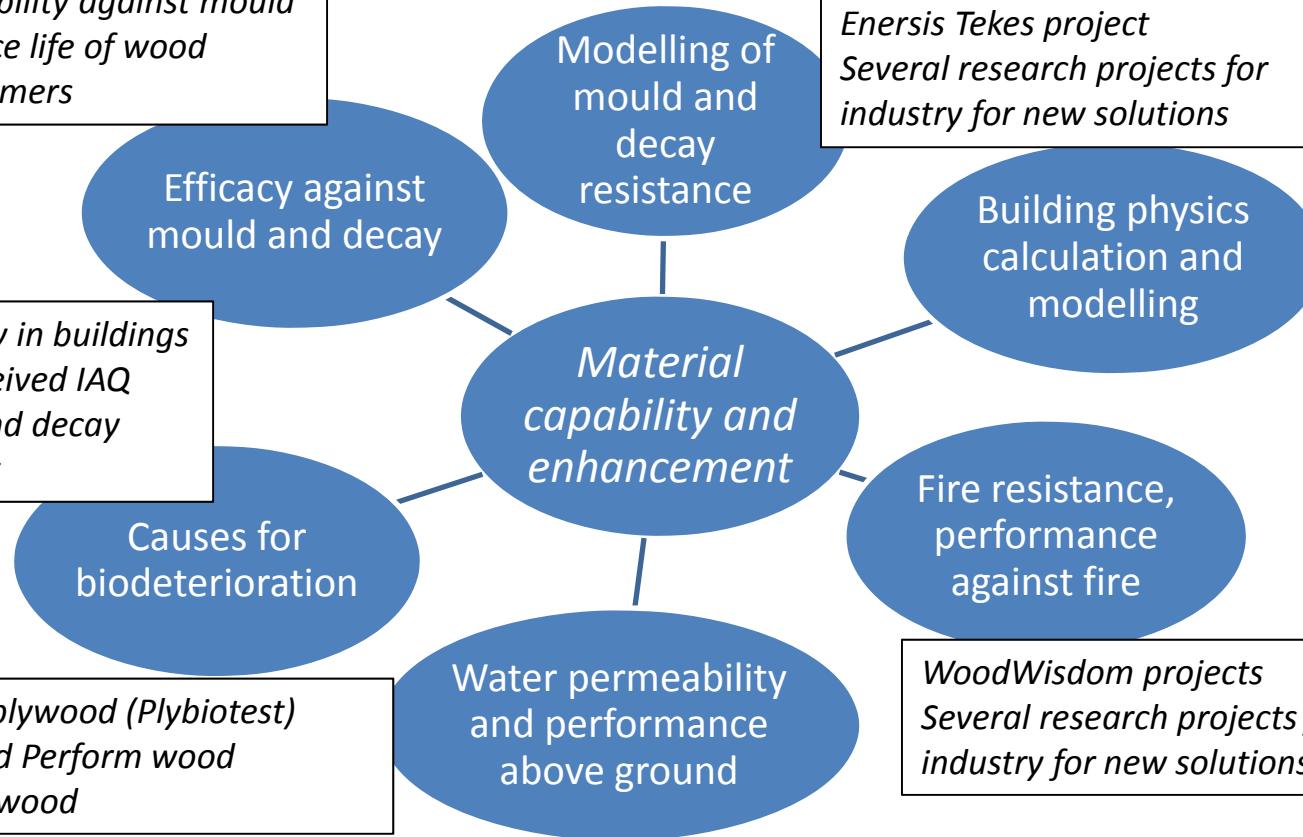


*Microbial biodiversity in buildings and impacts on perceived IAQ
Analyses of mould and decay damages in buildings*



*Durability of coated plywood (Plybiotest)
CEN TC 38 WG 28 and Perform wood
Durability of Thermowood*

*Mould modell Tekes project
VTT projects on modelling
Optikesto Tekes project
Enersis Tekes project
Several research projects for industry for new solutions*





Several research projects for industry for new solutions
Properties and resistance of new bio-based products, modification of polymers
Encapsulation of biocides

WoodExter (WoodWisdom), climate exposure
VTT projects on service life
Optimisation of durability and service life
Research projects for new solutions
100 years' service life of wood material (dry)

Modelling service life of building components

Building physics calculation and modelling

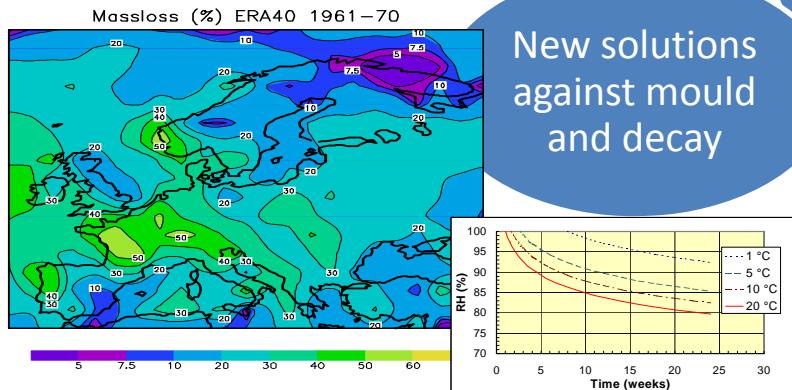
Functionality and performance

Renovation of energy efficiency of buildings "Energis"
Thermal comfort of users
Heat and moisture performance of a wooden exterior wall

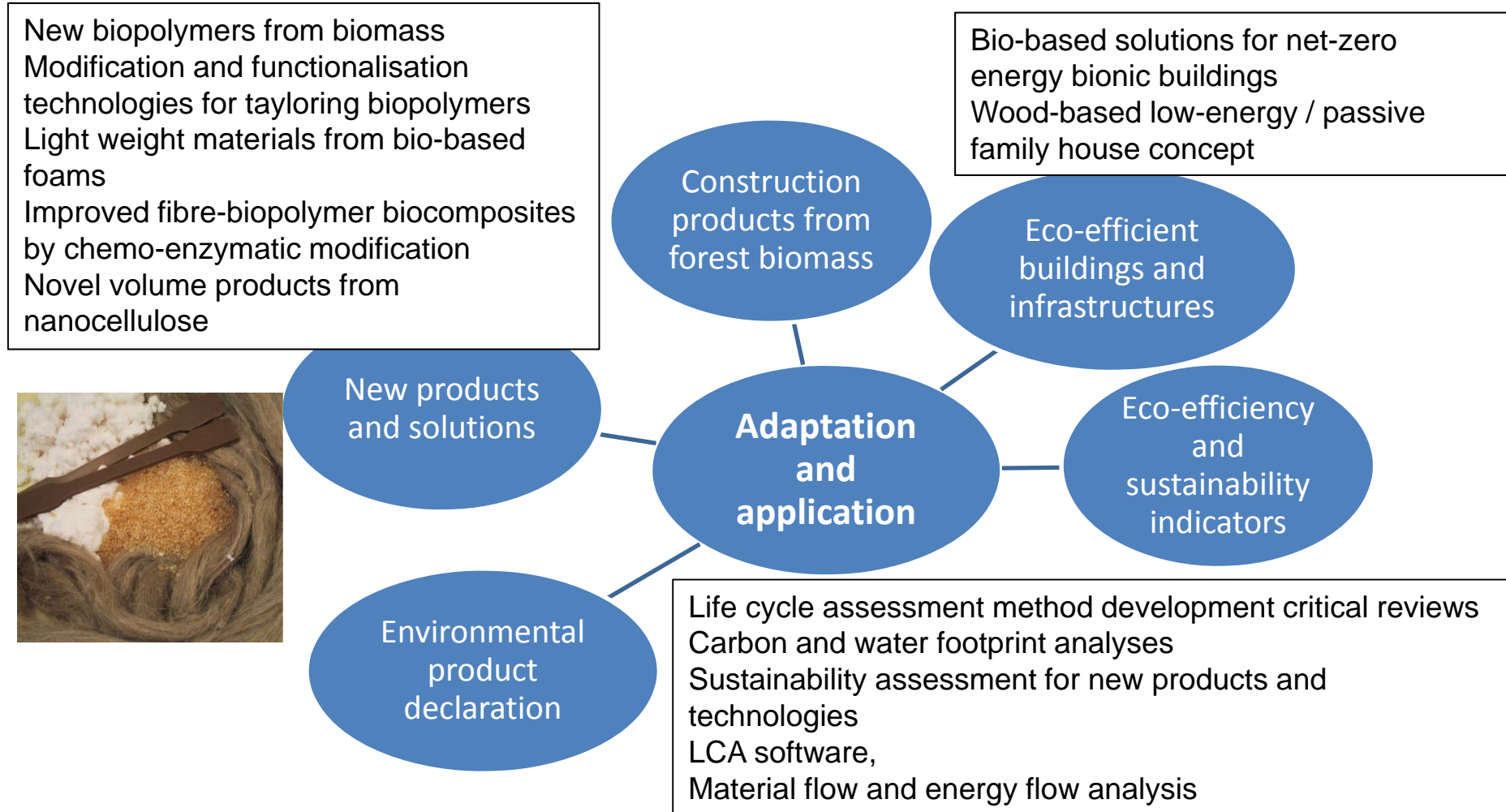
Eco and energy efficiency of built environment

Performance above ground and field analyses

New solutions against mould and decay



Performance of coated plywood, Plybiotest 2 project
CEN TC 38 WG 28 and Perform wood
Durability of Thermowood
DURA TB - Durable Timber Bridges, WoodWisdom net work





Wood durability testing in soil contact
Genetics and wood durability

Future raw materials basis and cultivation forestry
Product properties and their improvements
Building with wood

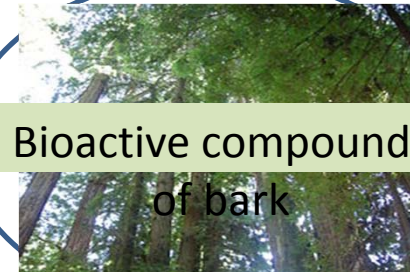


Efficacy against decay

Wood-based raw materials

Material capability and enhancement

Added value of forest products

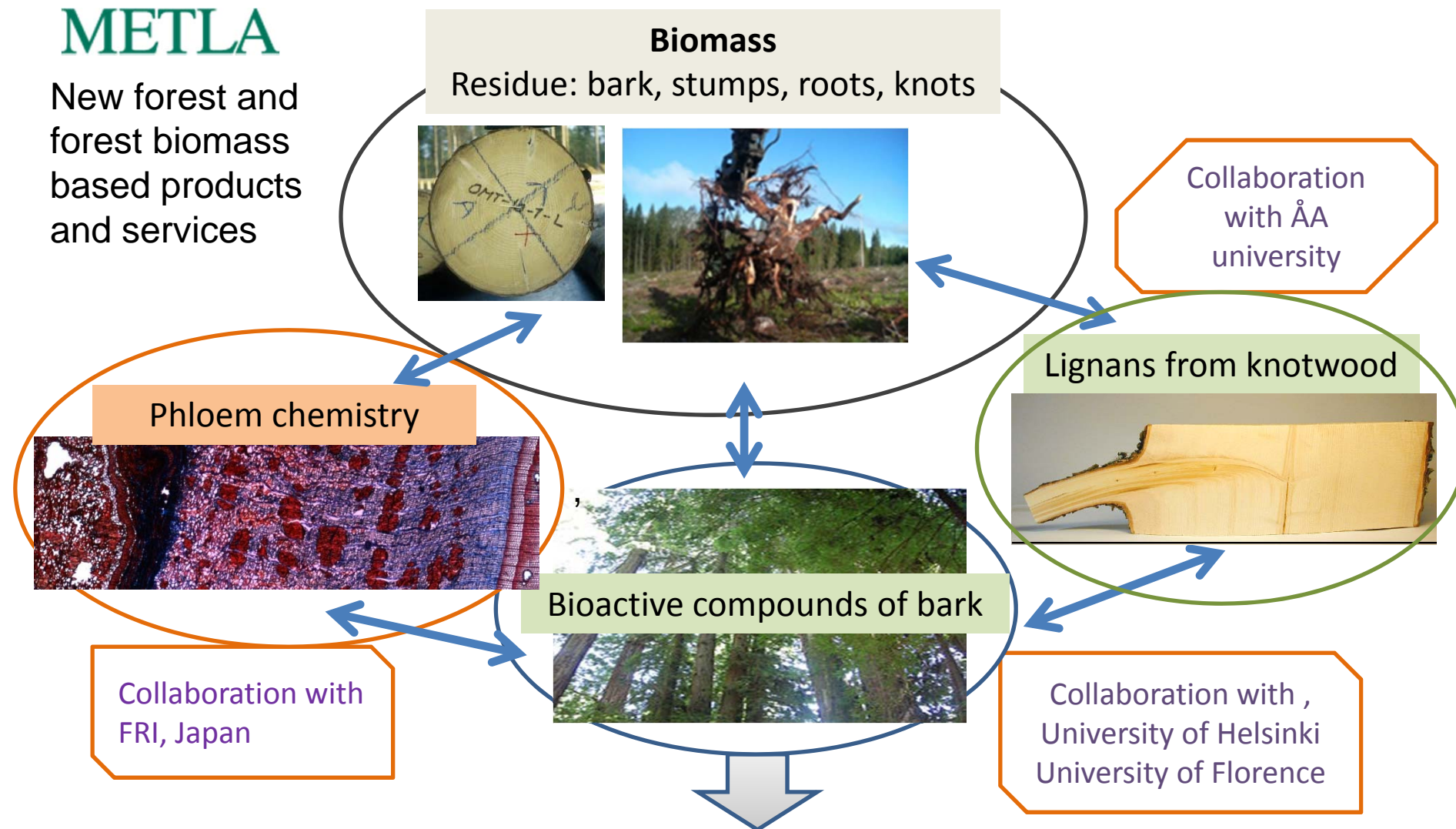


Bioactive compounds of bark

Weather resistance

Biomass: Residue: bark, stumps, roots, knots
Lignans from knotwood (Metla, Åbo Academi)
Bioactive compounds of bark (Uni Helsinki, Florence)

UV-protection, mould protection, termite protection



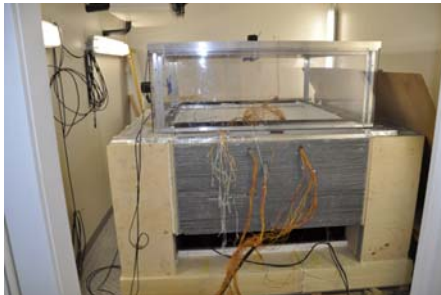
Added value of forest products
UV-protection, mould protection, termite protection



Analysing moisture performance of envelope assemblies

**Determination of building
physical test years in
Finnish climate**

TUT and FMI 2010 – 2012



**Development of
calculational mould
growth model**

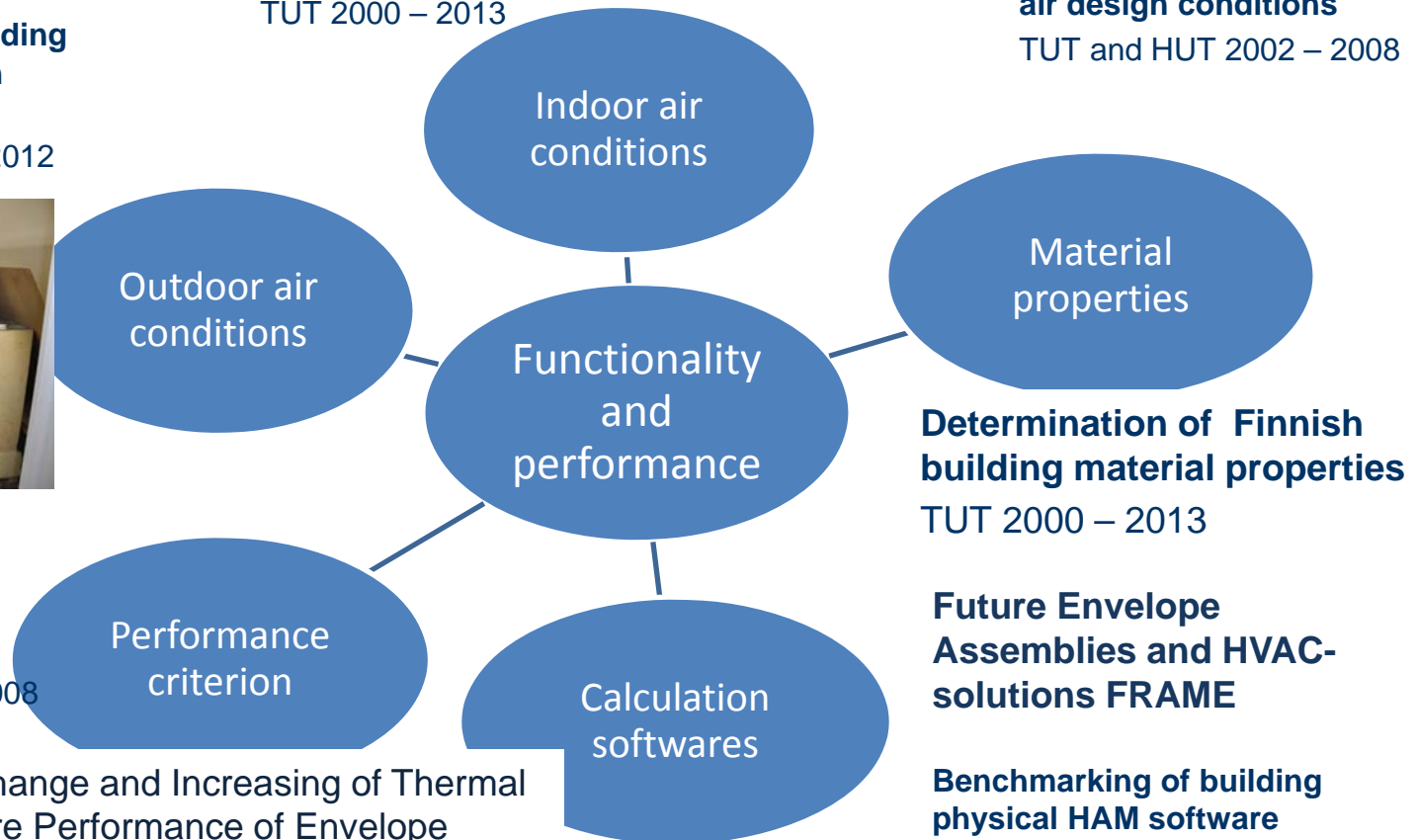
VTT 1986 – 2004

TUT and VTT 2005 – 2008

Effects of Climate Change and Increasing of Thermal
Insulation on Moisture Performance of Envelope
Assemblies and Energy Consumption of Buildings

Development of analysing principles

TUT 2000 – 2013



**Determination of indoor
air design conditions**

TUT and HUT 2002 – 2008

**Determination of Finnish
building material properties**

TUT 2000 – 2013

**Future Envelope
Assemblies and HVAC-
solutions FRAME**

**Benchmarking of building
physical HAM software**

TUT 2001 – 2013



BUILDING PHYSICS, Calculation software

Analyses of hygrothermal performance of envelope assemblies

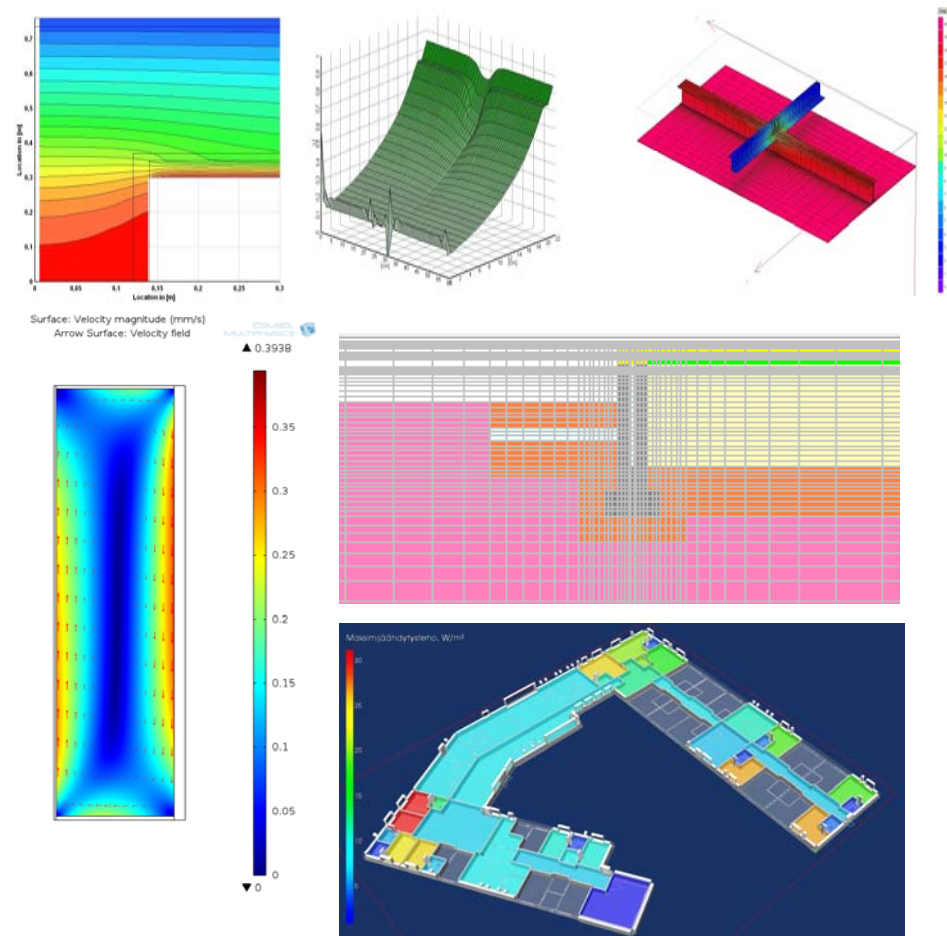
- DofTherm 1D
- HEAT 2D and 3D
- WUFI 1D and 2D
- Delphin 2D

Calculations of buildings energy consumption

- www.laskentapalvelut.fi (The Finnish Building Code for energy requirements)
- IDA-ICE 3D

Heat transfer and air flow investigations (now with moisture)

- Comsol Multiphysics 3D

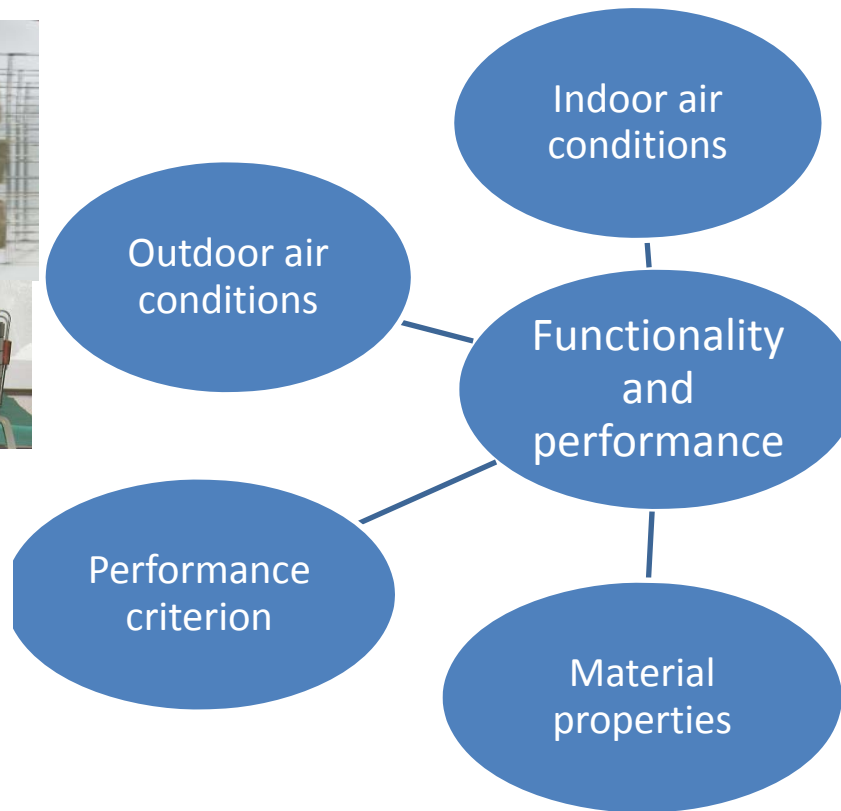




Indoor Environment – Science based
solution for indoor life quality 2011-2015



Risk assessment
of IAQ in buildings
with deteriorated
building materials
Microdiverbuilt
project 2012-2014

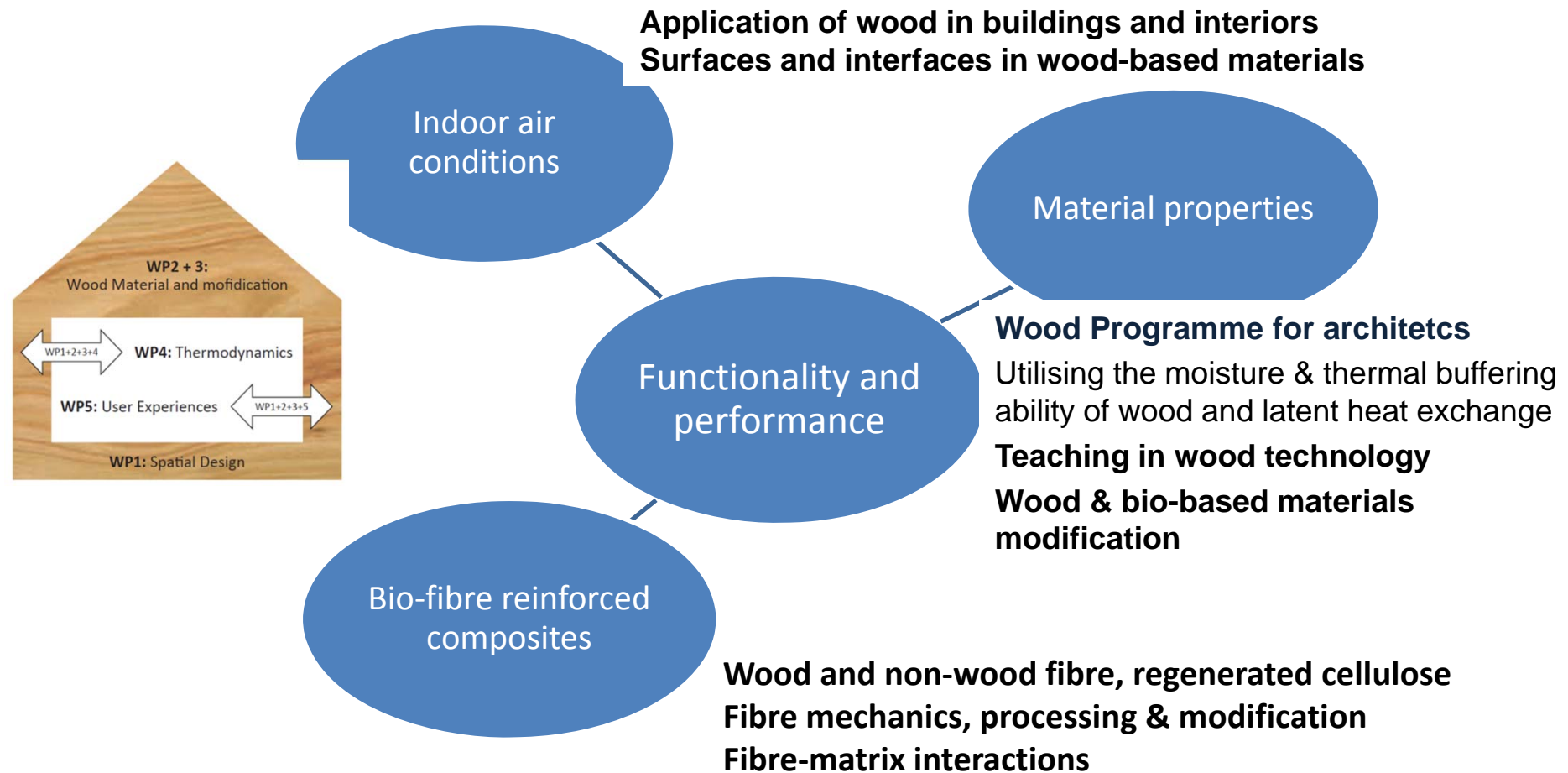


**Development of bioaerosol
testing facility - application for
modelling and controlling indoor
air quality (BITEFA)**

Microbial characterization of
green and non-green building
materials (fungal and bacterial
growth on the materials)

Modeling the impact of microbial
growth in the building on indoor
air quality

Bioaerosol release from the
contaminated materials





VTT: Production of bio-based products, test methods for durability of products, tools for service life and LCA analytics, epifluorescence microscopy, confocal laser scanning microscopy (CLSM), scanning electron microscopy (SEM), fluorescent *in situ* hybridization (FISH) tools, Combination techniques: physical, chemical and biological tools, molecular methods, pyrosequencing data analysis.

TUT: Faculty of Built Environment were considered excellent (international Research Assessment Exercise 2011): material testing, laboratory test facilities for envelope assemblies and field tests. Also numerical heat and moisture simulation tools, e.g. Comsol Multiphysics, Delphin 5, IDA-ICE and Wufi 1D and 2D.

METLA: Analytics of wood components and extractives, wood quality analytics

UEF: Indoor air quality (IAQ): VOC with TCD-GC-MS, SVOC with GC-MSD, HPLC, CO, CO₂, Microbial contaminants in the air, Particle concentrations: OPS, Dust Trak, P-trak, filter sampling.

Specialist equipment

January 2013



INSTITUTE	Properties						Environmental				
	Natural Durability	Moisture / sorption studies	Resistance to mould	Fire resistance / reaction to fire	Insect /termites / pests	Dimensional stability	Life Cycle Assessments	Whole Life evaluations	Product accreditation	Emission testing	Environmental Product Declaration (EPD)
VTT	x	x	x	x		x	x	x		x	x
Metla	x	x	x		(x)	x					x
TUT		x	x	x							
UEF			x		x					x	
Aalto	x	x	x			x	x	x		x	x

Specialist equipment

January 2013



INSTITUTE	Laboratory tests						Field tests				
	Natural Durability	Mould resistance	Insect /termite testing	Leaching / weathering	Sorption studies	Dimensional stability	In ground contact tests	Out of ground contact tests	Natural weathering	Surface performance / coatings	Moisture data logging
VTT	x	x		x	x	x	(x)	x	x	x	x
Metla	X	X	(X)		X	X	X				
TUT		x			x				x		x
UEF		x									
Aalto						x			x	x	