



CoE LignoSilva - new technologies in wood value chains

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on sustainable bioeconomies, September 27 , 2021

Presentation focus

- 1) Policy framework supporting forest bioeconomy
- 2) Forest-based industry in Slovakia
- 3) Centre of excellence LignoSilva: new technologies for increasing added value in wood and paper processing

Policy framework supporting forest bioeconomy in Slovakia

Smart Specialisation Strategy – RIS3SK (2013-2020)

Smart Specialisation Strategy – RIS3SK (2021-2027)

Domain 1: An innovative industry for the 21st century

Domain 2: Mobility for the 21st century

Domain 3: Digital transformation of Slovakia

Domain 4: Healthy society

Domain 5: Healthy food and the environment



Priority Area 1-2: Processing of raw materials into products with higher added value

Priority Area 1-3: Advanced technologies and materials

Priority Area 1-5: Efficient waste management

Priority Area 5-2: Circular production systems based on biomass

Priority Area 5-4: Sustainable natural resources (soil, water, biodiversity, ecosystems)



RIS3SK 2021+ areas elaborated in National Forestry Program 2021-2030

FORESTRY

Support of close to nature forest management to increase multifunctionality and resilience; Growth of added value from ecosystem services; Increasing and diversifying production through agroforestry systems.

WOOD PROCESSING INDUSTRY

Increasing added value through new technologies as 3D CT log scanning and new products as composite and agglomerate materials and greater use of energy-efficient, modular wooden buildings and flexible housing structures.

PULP AND PAPER INDUSTRY

Value-added increase through new products as biodegradable packaging, smart packaging (replacing plastic), processing of pulp into textile fibres, and developing technologies to reduce the carbon footprint and lower of energy consumption.

BIOENERGETICS

Valorisation of logging and new technologies of wood residues processing with higher energy efficiency; developing „advanced“ biofuels based on lignocellulosic materials.

CROSS-SECTORIAL TRENDS: Transformation to „zero-waste, circular society“ and FBS digital transformation

Forest-based sector – in short



Growing stock

483 million m³

248 m³.ha⁻¹

Felling

~ 10 mil m³

Revenue

~ 4.1 mld. €

FBS added value

~ 1.2 mld. €

Share to GDP

~ 1.5 %

Employment

~ 70 ths.

Sawmill	Location	Annual processing capacity [m ³]	
Rettenmeier Tatra Timber	Liptovský Hrádok	700,000	
PRP	Veľký Krtíš	700,000	
Amico Drevo	Oravský Podzámok	120,000	
P.F.A.	Lozorno	90,000	
Pilex Slovakia	Podolínec	84,000	
Kamwood	Lučenec	60,000	
Wood-based panels manufacturer	Location	Chipboards, agglomerated wood [tons]	
KronoSpan	Zvolen	350,000 (planned 450,000 recycled wood)	
Pulpmill	Location	Paper and sulfate pulp production [tons]	
Mondi SCP	Ružomberok	630,000 (paper) + 100,000 (pulp)	
Bukóza Holding	Hencovce	126,000	
MetsaTissue Slovakia	Žilina	80,000	from recycled paper
SHP - Slovak Hygienic Paper Group	Harmanec	60,000	

Centre of Excellence LignoSilva



CoE LignoSilva connects the research capacities of the **National Forestry Centre** and the **Pulp and Paper Research Institute** in Bratislava with relevant business entities deal with wood production and processing . The main goal is to bring excellent research and applicable innovation into FBS in two research areas:

- Intelligent technologies supporting wood production and industrial wood processing.
- The use of lignocellulosic material for biodegradable packaging and papers with multifunctional properties.

2014 - 2016	2016	2018 - 2023	2020
Horizon 2020 CSA project phase 1	Horizon 2020 CSA project phase 2	Research agency Infrastructure project	Institutionalize of the Centre of Excellence
467 tis. €	Seal of Excellence	9.88 mil. €	

2018 ->
SRDA and MA SR Research & Innovation projects
1.2 mil. €

LignoSilva excellent research is supported by the existing laboratories and by ongoing completion with unique technologies, namely:

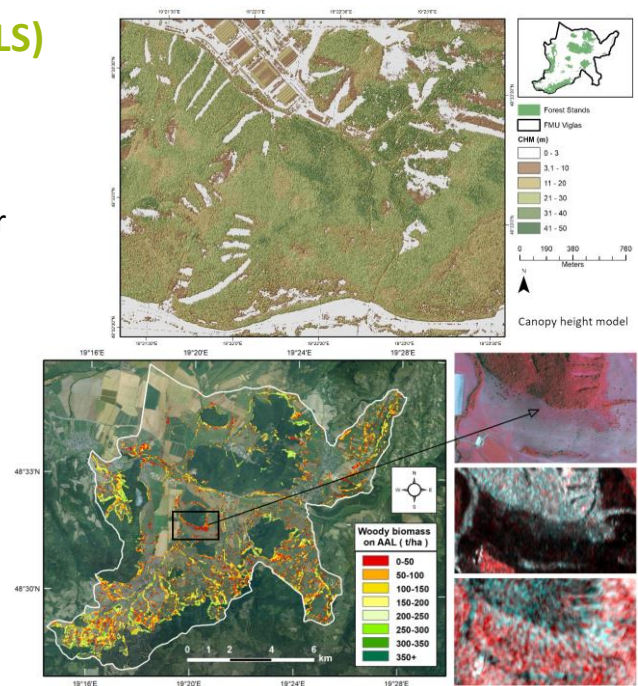
- **Radar & Airborne Lidar** technologies connection with **Mobile Terrestrial Laser Scanning & 3D Computer Tomography scanning technologies** for forest inventory, forest stand assortment, grading, primary and secondary log breakdown, sharing data for optimizing wood flow, with the aim to increased yield from wood production & processing.
- **Universal pilot paper machine** for research of special papers and biodegradable and compostable packaging based on paper and paperboard.

Radar & Airborne lidar scanning (ALS)

Infrastructure: Leica ALS 70-CM, Leica RCD30

CoE research topics:

- Growing stock estimation on FL from lidar with accuracy comparable with terrestrial approaches.
 - Derivation of Canopy Height Model
 - Modeling of stand parameters: Number of trees per hectare, Mean stand height and diameter; Standing volume per hectare.
- Unlock of radar Sentinel-1 potential for AGB estimation on AAL: backscatter, coherence, dual-polarimetry (RMSE = 41,2 t.ha⁻¹ (35 %))
- Custom software solution and web services: reFLex, LGIS, STALES



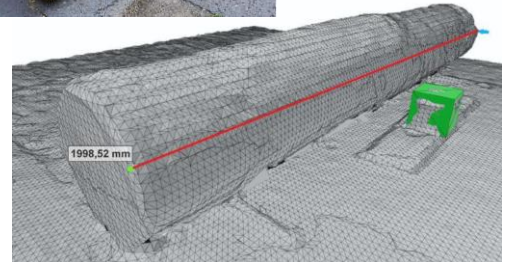
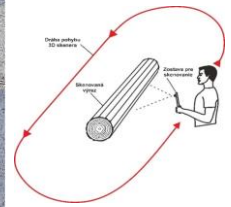
Projects ATBIOMAP and GeoMON were supported by European Space Agency and Slovak Research and Development Agency

Mobile terrestrial laser scanning (MLS)

CoE research focus:

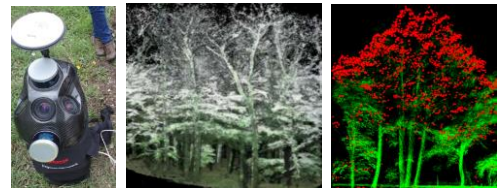
Fast 3D scanning through iPad

- Testing and developing methodology for fast estimation of log volume in stock.
 - Scanning device STRUCTURE sensor MARK II from the company Occipital. The sensor connected to iPad turn it into a portable 3D scanner.
 - Currently, the system underestimates the volume of logs by 8%.



Wearable, mobile 3D Laser Scanner (Leica Pegasus Backpack)

- Data fusion with ALS, tree volume estimation and detection of external defects (knots, cracks, rot, log shape)
- Proposal of new stand assortments approaches (in stands before logging; wood supplies planning)



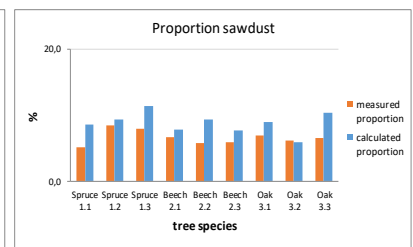
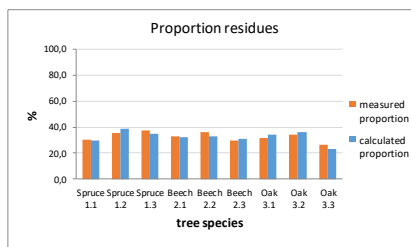
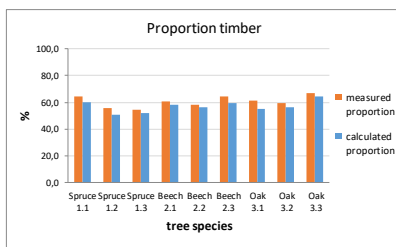
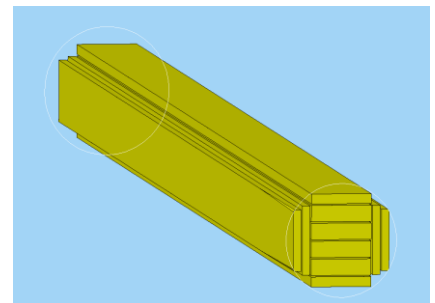
Projects SLOVLES and GeoMON were supported by Ministry of Agriculture and Slovak Research and Development Agency

OPTIREZ - program for optimizing cutting plans

CoE research focus:

Custom software solution for optimizing cutting plan

- Comparison of measured and calculated values of product proportions (timber, residues and sawdust). The model:
 - overestimates the proportion of timber products by 3.7%
 - underestimates the proportion of residues by 0.14%
 - underestimates the proportion of sawdust by 2.25%



Projects SLOVLES has been supported by Ministry of Agriculture of the Slovak Republic

3D log scanning – way to optimization of the sawing process / cutting plans

1. Real log scan
2. Defects detection
3. Generation of virtual boards for the given sawing parameters.
4. Cutting plan draft
5. Optimization of the cutting plan taking into the consideration the defects, required products



Projects SLOVLES and Ligno3DSCAN have been supported by Ministry of Agriculture and Slovak Research and Development Agency

3D Computer Tomography scanner – breakthrough technology in wood processing

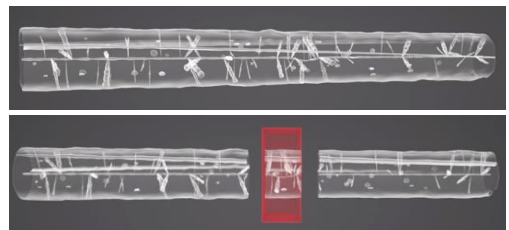
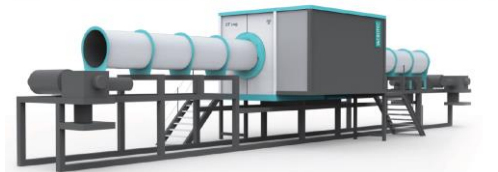
CoE research focus

Connectivity and sharing of data from forest and CT log scanning to optimise:

- LOG BUCKING
- LOG GRADING
- INDUSTRIAL WOOD PROCESSING
- CUSTOMISATION, FLEXIBLE PRODUCTS DELIVERING (supply of right wood to right sawmill)
- TRACEABILITY „DIGITAL FOOTPRINT“



CT LOG SOLUTION
X-RAY COMPUTER TOMOGRAPHY FOR DEFECT DETECTION AND QUALITY EVALUATION ON LOGS



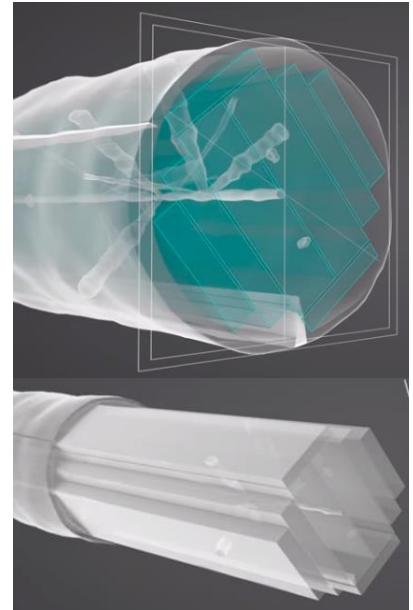
Project LignoSilva - Centre of Excellence of Forest-based Industry has been supported by the Research Agency

3D Computer Tomography scanner - Open collaboration platform

- Precise scanning of wood logs in resolution 10 x 2 x 2 mm
- R&D and testing of algorithms for wood defects detection; Cutting pattern optimisation; Analyse of timber surface patterns for decorative purposes; Wood flow tracking of each piece of log, assortment, lumber, product.
- Only one in the world open for R&I cooperation
- Availability in Zvolen – expected commissioning May 2022

Benefits:

- Valorisation of wood, reduction of waste and production costs
- Certification of scanned logs
- Objectification of supplier-customer relationships



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Pilot paper plant – upgrade of unique technology



**LIGNO
SILVA**

CENTRE OF EXCELLENCE
OF FOREST-BASED
INDUSTRY



CoE research focus:

- Paper and combined biodegradable packaging based on paper and bio-based plastics with special barrier properties
- SMART packaging

Benefits:

- The substitution of plastic packages with biologically degradable and compostable packaging materials based on paper and corrugated boards.

Pilot line specification:

- Universal paper machine with three head boxes for up to three-layer papers with and a continuously operating sizing press
- Pilot universal machine Anger (coating and laminating) with a working width of 600 mm and maximum temperature of drying 190 °C
- Pilot plant supercalender Kleinewefers with a working width of 600 mm

Pilot paper machine – paper production



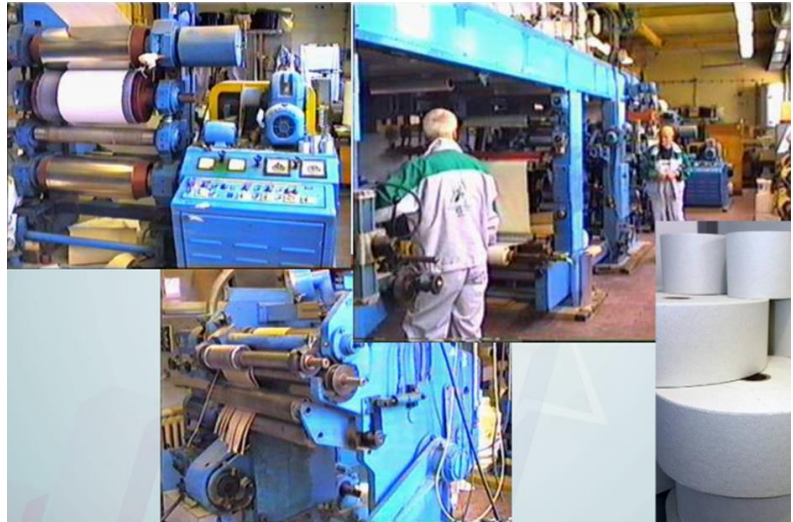
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Pilot paper plant – Open collaboration platform



Pilot Plant Coating/Laminating Machine – Surface Treatment

- Research of special paper production and on-line non-destructive testing
- Only 1 in the Central Europe open for R&I cooperation
- Availability in the Gabčíkovo locality (near Bratislava) – scheduled commissioning October 2022



Project LignoSilva - Centre of Excellence of Forest-based Industry has been supported by the Research Agency



<http://lignosilva.nlcsk.org/>

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Thank you for your attention



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