

PROPOSAL

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COLLABORATION IN RESEARCH, DEVELOPMENT AND INNOVATIONS IN WOOD SCIENCE, FOREST PRODUCTS AND BUILDING AND LIVING WITH WOOD

Ref: Discussion with Jouko Peltola, KOSEK Kokkola, Finland, 26.6.2015

Dear Professor Gao

Mr. Jouko Peltola, Business Development Director of KOSEK Kokkolanseudun Kehitys Ltd., the regional development company in Kokkola, Finland, contacted me in late June, about the Finnish potential and interest to develop research, development and innovation collaboration with the partners in China in wood science and forest products, especially from the perspective of wood materials, mechanical wood processing and building and living with wood. Therefore, I will present here a set of items and ideas where and how the Finnish scientific society as well as public development organisations and private enterprises could collaborate in a fruitful way with the Chinese partners, especially your university.

Background for expertise and collaboration

I am holding the post of professor of Wood Science and Technology (since 1998) and working also as director of research programme Wood Materials and Products in the Development of Bio-economy (MAT programme, 2014-2018) and leader of the team Wood and Fibre Based Products at the Natural Resources Institute Finland (Luke). The professorship is defined, in the first hand, for research and development on wood-based raw materials and their utilization in SMEs and the dissemination of research results for the consideration in the decision making of public and business sectors of forestry and forest-based industries. See my academic profile and competence and the aims of the MAT Programme in the websites:

<http://www.metla.fi/pp/EVer/index-en.htm>

<http://www.metla.fi/ohjelma/mat/index-en.htm>

The institute Luke was established in the beginning of 2015, as a result of the merger of Finnish Forest Research Institute (Metla), my previous employer, with three other research institutes under the Finnish Ministry of Agriculture and Forestry. Luke has currently an annual budget of approximately 90 million euros per year and personnel of 1600 people. Activity in wood science and forest products is run by about 25 scientists and 10 assisting workers (field technicians, laboratory and data experts). For more information, see <http://www.luke.fi/en>.

My further suggestions in this proposal imply largely the aims of Luke; however, they should reflect also the views of other research and development organisations in Finland. In addition to Luke, the following universities and research organisations carry notable research, education and development work that benefit wood products sector and further uses of wood:

1. Academic universities

- Aalto University, Espoo (forest products technology, wood material technology, chemical engineering, civil engineering, architecture, arts & design, business school)
- University of Eastern Finland (UEF), Joensuu and Kuopio (forestry, physics, chemistry, wood materials science, biology)
- University of Helsinki, Helsinki (forestry, wood technology, physics, biology)
Some also in: Tampere University of Technology (civil engineering, automation technology), University of Vaasa (business school), Lappeenranta University of Technology (mechanical engineering, energy technology), University of Oulu (biotechnology, processing technology, architecture)

2. Universities of Applied Sciences

- KARELIA, Joensuu (forestry, building with wood, also: Asian Gateway Project)
- SAVONIA, Kuopio (building with wood)
- Lahti (wood engineering, furniture, design)
- Ylivieska (surface technology, automation)
Some also in: Tampere (forestry and civil engineering), Evo and Rovaniemi (forestry), Kemi (civil engineering)

3. Regional or municipal development agencies, companies and technology parks, such as KOSEK Ltd. and KETEK Ltd. in Kokkola, Western Finland, and JOSEK Ltd. and Joensuu Science Park Ltd. in Joensuu, Eastern Finland.

4. Research or development companies of Finnish state, such as VTT Technical Research Centre of Finland Ltd., or industries, such as Finnish Wood Research Ltd. and PUUINFO Ltd. (to be parts of Finnish Wood Product Industries, a registered association) or Finnish Bioeconomy Cluster FIBIC Ltd. and CLEEN Ltd. (to be parts of CLIC Innovation Ltd.).

Metla has agreed a Memorandum of Understanding concerning research collaboration with Chinese Academy of Forestry (CAF) in 12.10.2012, the agreement being valid until 31.12.2016 and being shifted to Luke after the merger. Since the agreement, Metla has been running research collaboration with Chinese scientific partners also through Beijing Forestry Society. However, few cooperation activities have been launched in wood science and forest products, so far through scientific visits and lectures only (Beijing Forestry University, Northeast Forestry University in Harbin, Nanjing University). Therefore, Luke welcomes the opportunity to intensify the practical collaboration also in this scientific discipline and research sector.

Mr. Peltola knows himself very well the industrial sector of wood products manufacturing and trade as well as biorefining in Finland, especially in the Ostrobothnian region in Western Finland. I am able to complete his views from the perspective of wood science and technology, wood measurement as well as development and innovation work around wood value chains and networks around building and living with wood, product and service portfolio, wood processing technology, business models and strategic and operational environment, and environmental competence, sustainability and role in the future's bio-economy as regards the success factors of wood products sector.

In Finland, research and development work in these items is most often performed in programmes and projects of the following levels:

- pan-european collaboration programmes and projects, funding from European Union or other international sources
- national collaboration programmes and projects, funding from domestic sources
- regional development programmes and projects, funding from European Union and domestic sources
- commitments from individual enterprises, industry federations, public administration bodies or regional development firms, funding from the owner of the project

The project funding consists then often of public source, funding from enterprises or other beneficiaries, and own funding of the organisation being responsible for the operations and results of the project. There are also domestic and international foundations and funds available, which can allow grants for smaller projects, exchange of scientists or other experts, personal further education, thesis works, study tours, dissemination activities, etc. The funding bodies consider almost always inclusion of international research collaboration as a merit for project applications when they make the decisions for funding.

Main development areas of wood utilization

Development of bio-economy, cleantech and digitalization are currently the key drivers of the Finnish development and innovation work to stimulate economic life and create welfare for the nation. They build also the basis for the public development initiatives according to the

policy programme of the Finnish government. Forest sector is in the core of the programme. Much emphasis is put in building with wood and expanding chemical wood processing (biorefining). Finland is a country with a small domestic market (population of 5.5 million). Therefore, export of investment and consumer products and miscellaneous industrial services as well as consulting, educating and other expert services are crucial for the economic welfare of the nation. Natural resources from wood and some minerals and their sustainable supply are the basis for the export industries, and secure availability of moderate-priced energy is a must.

We have already seen practical results in the re-expansion of wood pulp industries (including lignocellulosic materials for textile industries), bioenergy conversion through side-streams of forest industries (e.g., tall oil based liquid fuels) and residual forest biomass and small-tree materials (CHP plants, pyrolysis oil refining) as well as renaissance of saw mill and plywood industries and building of wood (multi-storey dwelling houses, schools, kindergardens, commercial buildings, bridges, noise walls, etc.). Next-generation biorefinery products are mostly under development, but are awaiting to be launched to the market. Still, we do have examples of potential products with techno-chemical benefits or bioactive effects. They provide physico-chemical functionalities for several types of products for industrial manufacturing or consumer uses, such as construction materials, adhesives, wood or metal paints or other protection agents, plant-protective products, detergents, cosmetics, beverages, and pharmaceutical or nutritional products.

In the development of all product groups and business concepts, the idea is to go toward low-carbon and safe environments through reducing carbon footprint, improving material and energy efficiency, replacing fossil fuels and non-renewable materials with non-fossil and renewable ones, diminishing waste load, increasing recycling and reuse and improving overall environmental competence throughout the entire life cycle. It is an important national target to improve the competition ability of the Finnish-based industries and its products both in the export and domestic markets. This covers business concept and technology development, market research and launch-up, improvements in existing and creation of new wood-based products and adding more service-related production to the products themselves.

Production of argumentation materials for different product and customer groups and market areas and developing technical tools for standardization of products requirements and building codes are also important targets. In raw materials research, it is important to find the technically and functionally suitable and cost-competitive products for the changing raw material basis in our forests, diversify the uses of side streams of forest industries and shift to studies that show the competence of wood-based products against non-wood products or the opportunities for multi-material applications where wood is used wisely with other materials.

Some suggestions for collaboration items in research and development

Based on the introduction in the previous chapters, I would like to suggest some potential research subjects and ways how to intensify collaboration between the research, development and innovation sectors and dissemination of industry and commerce in China and Finland.

1. Areas of research and development

- Long-term durability of wood houses, structures and materials in different climatic conditions, including the basis of standards and product requirements
- Developing strong, stable and weather-resistant wood materials for building of different-size houses (multi-storey houses, small private houses)
- Building techniques and materials for areas and sites with serious natural hazards (earthquake, avalanche)
- Technical feasibility and standards of modified wood products vs. alternative non-wood products – also combinations of different materials
- Combinations of wood and stone/glass/ceramics/minerals in home yard, garden and public outside building (selected species and materials from China and Finland)
- Characterization of Finnish and Chinese plantation species for visual, physical and mechanical properties (softwoods and hardwoods)
- Sorting and pricing potential and applications for Finnish and Chinese plantation species (logs, sawn timber, veneer, other uses)
- Improving the raw material efficiency and cost structure of Finnish and Chinese species (miscellaneous products of mechanical wood processing)
- Opportunities for exporting logs or sawn timber from Finland to China
- Pharmaceutical and nutritional compounds and products from Finnish and Chinese species (especially: lesser used tree and shrub species, by-products from forest industries)
- Liquid biofuels from Finnish and Chinese species
- Role of environmental competence of wood-based products in different market areas
- Health effects of wood-based products and product combinations in the environments of living and working
- Consumer perceptions and expectations and their reflections to product and service development in different product groups in Finland and China

2. Areas of dissemination

- Building codes and requirements in different types and sizes of houses
- Increasing export of pre-fabricated log houses and wood-element houses and their components from Finland to China
- Mechanized timber harvesting in different climate, terrain and tree-stock conditions
- Education practices in academic universities and universities of applied science in Finland and China – exchange of teachers and students
- Implementation of research methodology in wood materials science and wood engineering in Finland and China, getting to know new research technology and equipment and sociological and customer research methodology

I hope some of these suggestions raise interest in Beijing Forestry University for collaboration in research, development and innovation work and lead to shared or parallel projects in any of these items. Natural Resources Institute Finland is ready for further discussions. I recommend you also to consider the universities that I listed before as potential partners. We all hope that the collaboration projects could finally lead to mutual economic and commercial benefits for the Chinese and Finnish parts as well, in a way or another.

I am happy to welcome the representatives of Beijing Forestry University to Finland to get acquainted with our research staff and development and innovation projects.

Yours sincerely,

Joensuu, Finland

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