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Research and Development Co-ordination and Funding Models in Jurisdictions outside Australia for the Forest and Wood Products Sector

An industry perspective

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An industry perspective

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Research and Development (R&D) Co-ordination and Funding Models in Jurisdictions outside Australia for the Forest and Wood Products Sector

The goal for this project was to prepare discussion paper on various Forest and Wood Product R&D Co-ordination and Funding Models in use in jurisdictions outside Australia.

Analysis of each jurisdiction is based on research reports, stakeholder interviews and consultation, web site reviews and local opinions. These analyses are of the depth that will stimulate discussion.

Comparison of spending and models between jurisdictions needs to be done with caution as currency and recording methods are often not comparable. However, to distill this information to be comparable would lengthen the report and have an adverse effect on readability. Some translations and definitions also create some inconsistency.

In spite of these hindrances of clarity it is still possible to make intuitive comparisons to allow innovative discussion and strategic thinking.

It is accepted that the analysis can be challenged to aid understanding or to pinpoint areas where further investigation may be required.

June 2010

Further inquiries

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ACRONYMS/ABBREVIATIONS

AF&PA	American Forest & Paper Association
ANU	Australian National University
APPI	Australian Pulp and Paper Institute
ATRI	Australian Timber Research Institute
A3P	Australian Plantations Product and Paper Industry Council
BMELV	Federal Ministry of Food Agriculture and Consumer Protection (German)
BP	British Petroleum
CCFM	Canadian Council of Forest Ministers
CEI-Bois	European Confederation of woodworking industries
CEPF	Confederation of European Forest Owners
CEPI	Confederation of European Paper Industries
COST	European Co-Operation in Science and Technology
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSTI	Centres of Excellence in Science Technology and Innovation (Finland)
DAFF	Department of Agriculture, Forestry and Fisheries
DGfH	German Society of Wood Research
DSE	Department of Sustainability and Environment
EC	European Commission
EFI	European Forest Institute
ELY	Elinkeino-, liikenne- ja ympäristökeskus. Finnish Centre of Economic Development
Era-Net Plus	A funding scheme of the FP7. Financial support for topping up joint trans-national research funding
ETP	European Technology Platform
EU	European Union
Eureka	European network for market oriented R&D that promotes market driven collaborative research and technological development
EUSTAFOR	Forum for the European state forest organizations
FFPC	Forestry and Forest Products Committee
FFPRI	Japanese Forestry and Forest Products Research Institute
Finpro	Association of Finnish Companies focussing on internationalisation of Finnish Industry
Finnvera plc	Specialized financing company owned by the State of Finland. It provides its clients with loans, guarantees, venture capital investments and export credit guarantees
Feric	Forest and forest harvesting research division of FPIInnovations
Forintek	Timber processing and products research division of FPIInnovations
FTP	Forest based sector Technology Platform (EU)
FP7	Seventh Framework Programme: the Framework Programme for research and technological development in the EU. Allocated 32,413 Million Euro in 2008
FPIInnovations	Canadian nonprofit member organization which carries out scientific research and technology transfer for the Canadian forest industry, based on priorities set by the company's members
FVA	Forest Research Institute of Baden-Württemberg
FWPA	Forest and Wood Products Australia
FWPRDC	Forest and Wood Products Research and Development Council
GERD	Gross Expenditure on R&D
GDP	Gross Domestic Product
Innofin	Foundation for Finnish Inventions
Metla	Finnish Forest Research Institute
NGO	Non-Government Organisation
NRA	National Research Agenda
NSI	Norske Skogindustrier ASA
PAA	Pine Association Australia
Paprican	Pulp and Paper Research Division of FPIInnovations
PBRI	Panel Board Research Institute Australia

PEFC	Programme for the Endorsement of Forest Certification
PFI	Fibre Institute Norway
PIMC	Primary Industry Ministerial Council
PISC	Primary Industry Standing Committee
PTS	Papiertechnische Stiftung
R&D	Research and Development
RD&D	Research, Development and Demonstration
RD&E	Research, Development and Extension
RMB	Renmimbi
RPCC	Research Priorities and Coordination Committee
RPRA	Radiata Pine Research Association
RWG	Research Working Group
Sitra	Finnish Innovation Fund is an independent public fund which under the supervision of the Finnish Parliament promotes the welfare of Finnish society.
SRA	Strategic Research Agenda
STI	Science Technology and Innovation
Tekes	Finnish Funding Agency for Technology and Innovation
UBC	University of British Columbia
UPM	International Finnish Company producing forest and forest products plus associated industrial products. Recently redefined as a Biofore organisation. "Bio" products and Forest products.
USA	United States of America
vTI	Johann Heinrich von Thunen Institute
VTT	Multi-technological applied research organization in Northern Europe. It provides high-end technology solutions and innovation services. VTT is a non-profit-making research organization.

EXECUTIVE SUMMARY

The forest and wood products sector is of great importance to many economies including Australia. This importance is based on different perspectives from different sections of the community:

- From an industry point of view it may be based on economic returns and long term business sustainability,
- From an academic point of view the sector provides a rich source of bio-knowledge that can lead to scientific breakthroughs to benefit society in many areas and industries,
- From a government point of view the interest may be in employment and social well being and
- From the general community it may be environmental and social well being

All stakeholders have overlapping desires which are aligned in a common desire to see the industry succeed and be sustainable.

For the industry to be sustainable and exist for the betterment of future society there needs to be strategic planning and management. Strategic planning and management needs accounting and economic information but also must obtain technical data, information and knowledge for sound decision making. There needs to be adequate investment in Research and Development (R&D) to provide such technical input for business sustainability.

This investment in R&D is also critical to manager technical risks. Risks may include competing countries and industries leap frogging current technical capabilities with new discoveries and applications. Other risks may be the loss of raw material supply due to new developments in industries outside the sector or loss of raw material due to bio-security breaches and incidents (e.g. Australian Pine Beetle Scenario). These risks can be managed both proactively and reactively with sound R&D centres of excellence.

R&D also provides a flow of continuous knowledge development and breakthroughs to allow an industry to be efficient and effective in managing the bottom line and ensuring the desirable positive impacts on society and the environment.

There are some concerns that R&D spend in all industries and in particular forest and wood products is being reduced to minimise operational costs. This paper is aimed at reviewing how other jurisdictions are managing in the environment of reduced R&D expenditure. The aim is to distil this broad review down to three or four jurisdictions that may provide the Australian industry with some practical themes that can be considered to reduce industry long term risk and improve business sustainability.

Initially twenty-plus jurisdictions were reviewed. This broad review looked generally at the R&D models of funding and co-ordination. Themes were considered that may be applicable to the Australian situation. Recommendations were taken from various international stakeholders as to which models were considered better practice than most. Based on this input plus a simple process of elimination, this list was reduced to a manageable group size for further analysis.

This smaller group was made up of the jurisdictions of USA, Canada, EU, Finland, Germany and China. These jurisdictions were reviewed against a performance criteria developed by the author with input from various stakeholders from within industry. This analysis allowed a model country to be defined for comparison to the Australian industry.

This model country was made up of the best practice aspects of Canada, Finland and the EU Forest Based Sector Technology Platform.

The actual funding models for these jurisdictions were then considered in detail based on the information available to assess similarities to the Australian situation and to assess learning opportunities that may not have been considered.

In summary, the general theme which improved performance in R&D management in the sector was a strong commitment and drive by industry. Also the ownership of the long-term development and sustainability needed to be with the industry not the authorities or academia. All jurisdictions were aligned in that strong academic institutions and support are a critical enabler but not a driver. The other aspect was that strong Government support, both political and financial, is required. This financial support was via different mechanisms to ensure commitment and accountability by industry. Financial support was shared amongst various sources. This share was able to move in percentage terms between industry and public based on national and industry economic performance at the time. Lobbying and business development management was required to keep funding streams open regardless of whether they were provided from the public purse or the private sector. Successful models have dedicated business development managers from industry to drive funding availability and take full advantage of public money and tax incentives but also market the organisations to attract industry and private financial support.

There was also a common pattern in the better models of alignment between all stakeholders. There was a form of "co-opetition" in which industry players network and co-operate to help the industry become strong and sustainable, yet they still compete for business.

There is a common approach in many jurisdictions to include Pulp and Paper plus the new Bio Industries in the Forest and Wood (Forest) Products sector. This definition of the industry allowed better alignment and co-ordination of R&D Centres of Excellence. This concentration of technical force allowed better co-operation, knowledge exchange, better spending power, lower overheads and more tangible outcomes.

Alignment with the newer sectors of nanotechnology and bio energy had generated substantial funding opportunities and Government and social support for the industries. The technical knowledge gained from these ventures was of benefit to understanding and management of forest resources and plantings and also to harvesting strategies and timber product design and market positioning.

The other aspect also evident in some jurisdictions was the R&D focus in the sector towards understanding the tangible effects on the sector caused by climate change. From this understanding R&D was needed to develop and plan technical solutions to minimise industry risk and in some cases capitalise on the changing environment. The drive to help reduce the impact of climate change on society was also a consideration by the sector via this mechanism.

This document presents a perspective of a better way to co-ordinate and fund R&D in the Australian Forest and Wood Products Sector. It is recommended that consideration be given to adopting, or in some cases continuing, themes evident in the jurisdictions of Finland, Canada and the EU model. The main theme is that the industry must lead and financially support the technical development of the sector. Government need to help with the appropriate support politically and financially. Academia must be developed and supported by both industry and Government. Technical talent development, including developing the next industry leaders, through R&D departments and organisations needs to also be a consideration in justifying R&D spends.

Numerous people interviewed suggested that the next step after this scanning exercise should be an international best practice study tour. This group, ideally consisting of industry leaders and senior Government representatives, could review the models on the ground to confirm the findings and tease out the practical strengths and weakness which are difficult to pinpoint from a remote study.

INTRODUCTION

There is a trend in many industry sectors of a reduction in spending in the area of innovation, research and development (R&D). This reduction appears to be in the business plans of private industries, universities and publicly funded bodies.

There is a strong focus in today's "here and now" society to develop business plans to deliver short to medium returns. This reduces the priority of allocating resources to strategic and long term needs of the business or sector. Research and development budgets are seeing the effect of this trend. The forest and wood products sector appears to be following this process with reduction in R&D spend in many enterprises across the globe.

The forest and wood products sector is of great importance to many economies including Australia. This importance is based on different perspectives from different sections of the community. An industry point of view may be based on economic returns and long term business sustainability. An academic point of view of the sector may be focused on providing a rich source of bio-knowledge that can lead to scientific breakthroughs to benefit society in many areas and industries. A government point of view may be the interest in employment and social well being. The general community may be focussed on environmental and social well being. All stakeholders have overlapping desires which are aligned in a common desire to see the industry succeed and be sustainable.

The sustainability of business and the raw material supply for such business in the Forest and Wood Products Sector is reliant on solid strategic planning which requires sound technical input to assist the strategic planning process. The concern that technical input will be reduced as a result of a reduction in R&D spend and resources, (including key technical knowledge holders), is recognised in many jurisdictions around the world, including Australia. There appears to be examples of organisations in jurisdictions outside of Australia implementing programs and initiatives to either reduce the trend of R&D reduction and/or to develop collaborative methodologies to reduce the impact of the diminishing R&D budgets.

This study was aimed at scanning the globe to document some jurisdictions that are adopting a better practice than Australia in this area, maintaining focus on long term and strategic needs of the sector through effectively co-ordinating and funding of research. The author of this study approached the task from a pragmatic/industry perspective as distinct from an academic/theoretical exercise.

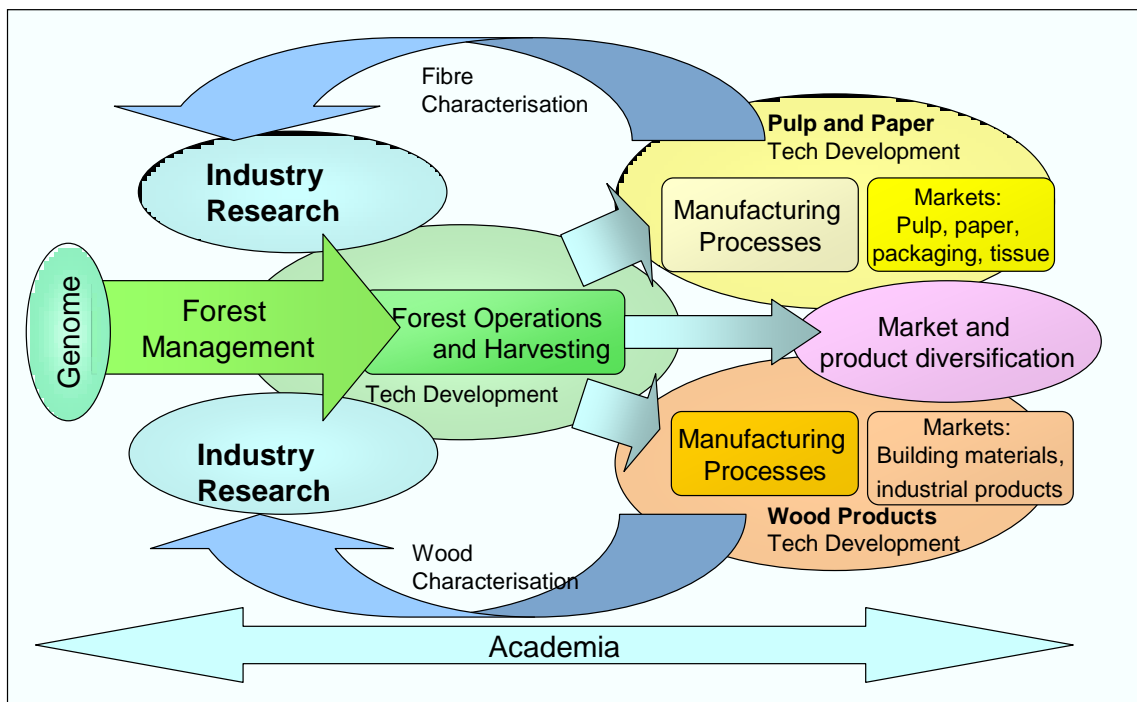
SECTOR SCOPE

The value chain of the forest is defined differently in the various jurisdictions around the world. The sector of forest and forest products appears to be a more common definition outside of Australia in recent times. This definition would include forest growth and harvesting and also include all forest products which encompass timber, wood building products, (including engineered timber products), pulp, paper, bio fuel, bio chemicals and other materials. Some jurisdictions also include food production, including meat, in the economic analysis of a productive forest but this is normally captured in the agricultural sector analysis.

In Australia the sector is defined as forestry and wood products and includes forest growth, harvesting, wood-processing and wood products in construction and other applications. Pulp, paper and other high value bio products are outside the scope of the current review. In spite of this scope restriction it was not possible to maintain the separation when considering other jurisdictions. Many jurisdictions outside Australia focus their effort and support systems on the entire forest products value chain.

This difference is best explained by the two diagrams below which were developed from the FPInnovations model of the forest sector value chain. Diagram 1 is a typical definition of the industry value chain in many jurisdictions outside of Australia and there is a growing trend towards this all encompassing definition.

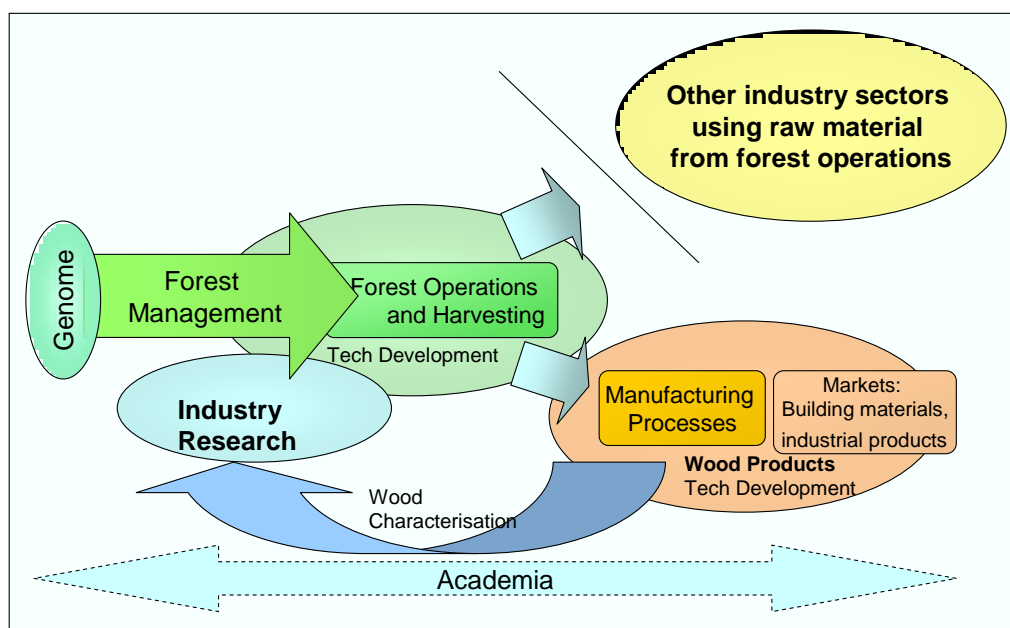
Diagram 1: Value Chain of Forest and Forest Products Sector



Notes for Diagram 1: Market and product diversification could include the newer technical fields of Bio energy and bio refining

Diagram 2 on the other hand shows the value chain disconnect and commodity type thinking evident in a reducing number of jurisdictions. This appears to be the model used in Australia. This segregated approach made comparison more difficult with other jurisdictions but did not impede some learning being gained when comparing non-identical industry sector scopes.

Diagram 2: Value Chain of Forest and Wood Products Sector



The global scan considered a number of jurisdictions which covered this sector and also gave some global spread.

It must be noted that the definition of a jurisdiction was not restricted by a national border. Some jurisdictions considered were states or provinces and others were a union of separate countries.

The time and detail of the initial broad scan implied, by design, that some good practice jurisdictions may have been overlooked for more thorough analysis. The plan was to not provide a **best** solution but to stimulate continuous enquiry to learn from others who may have a **better** practice. A more detailed study with perhaps a best practice tour would address this issue.

PHASE 1 - INITIAL BROAD GLOBAL SCAN

The project of review of different jurisdictions was carried out in three phases. The initial phase was a broad global scan to develop a list of jurisdictions to consider. Table 1 lists the jurisdictions considered in Phase one of the review. This initial list was reviewed and reduced to six jurisdictions for a more detailed analysis, based on recommendations of international industry players and a simple process of elimination.

The second phase was the more detailed analysis of the six selected jurisdictions.

The third phase was the documentation phase to capture the salient points from the analysis and even more detailed review of the model country made up of three jurisdictions.

Table 1: The jurisdictions considered in the initial broad scan

Country or jurisdiction			
United States of America	European Union	Norway	New Zealand
Canada	Malaysia	United Kingdom	South Africa
Brazil	Finland	Sweden	Ghana
Chile	Germany	France	Kenya
China	Korea	Austria	Russia
Japan			

Based on the information that was available in the limited time frame a hypothesis was developed for each jurisdiction in Phase 1. These hypotheses were used to select the jurisdictions of most interest based on the recommendations of stakeholders and the process of elimination outlined below. These hypotheses were tested by the more detailed analysis in Phase 2 for those jurisdictions selected for further evaluation.

The testing of the hypotheses of those not selected for Phase 2 were not carried out and these hypotheses remain open as discussion points and may in some cases be proven as null hypotheses by those more involved or with more information at hand.

Summary of findings and hypotheses from the initial scan

United States of America (USA)

The USA was very active in Forest Products R&D under the 2020 technology alliance program.

Seven technology platforms provide focus for Research Development and Demonstration (RD&D):

- Advancing the forest bio-refinery
- Sustainable forest productivity
- Breakthrough manufacturing technologies
- Advancing the wood products revolution
- Next generation fiber recovery and utilization
- Positive impacting the environment
- Technologically advanced workforce

Other initiatives and funding were evident although overall funding appeared to be reducing. Focus appeared to be on quick returns, so applied research was the main area of activity and funding.

The political direction for the USA appeared to be on a drive for domestic growth and market development. This differed from some other jurisdictions that were putting the main R&D effort toward export markets.

Canada

Canada was active with the FPInnovations organization which was striving to optimize forest sector value chain. This organization was formed in 2007 and is made up of four divisions FERIC (forests), Forintek (timber processing), Paprican (Pulp and Paper) and the Canadian Wood Fibre Centre.

It was similar to the USA, in that other initiatives and funding were evident through the sector. It was also similar in that overall funding appeared to be reducing.

Unlike the USA, market focus in Canada appeared to be more on export opportunities, especially China. The forest sector for Canada is of greater importance to their national and provincial economies; therefore it attracts more political attention, funding and job creation initiatives.

Brazil

Brazil had two differently administered industry sectors. There is the tropical forest research and research into fast growing introduced species such as Eucalypt.

Industry and business funded R&D was a small and reducing part of the overall R&D program.

There was a rapid growth in the forest and wood products sector in a rapidly growing economy. This focus on securing ready income in this fast growing economy appeared to be distracting industry from the long term issues and opportunities like building R&D capabilities.

In Brazil there also appears to be poor co-ordination between regions and protectionism within the industry which hinders collaborative research.

Regional differences were extensive, with the Sao Paulo region taking a high percentage of public funds.

Chile

Chile appeared to be seizing the opportunity of natural resources without a structured long term R&D plan. There was little collaboration between the main businesses on R&D matters. There is also a risk adverse approach to R&D with poor take-up of discoveries unless demonstration is first carried out by "someone else".

There was a need for higher collaboration, better R&D capacity, less bureaucracy and more flexible public funding to achieve a better result.

At the time of the investigation Chile was subject to a devastating earthquake. This prevented further stakeholder discussion during phase one of the project.

China

China has significant investments going into the industry and is predicted by an EU study to be the future power house of R&D.

The model appeared to be the older style of R&D, in that it was Government controlled and funded, research was compartmentalized with no cross discipline research, minimal interaction between stakeholders and the scientists and private sector participation appeared lacking.

China is now in the top three investor countries in R&D behind USA and Japan. There were significant questions about China to suggest it needed further review in phase 2. Questions such as:

- How much research spend is in the forest and wood products area?
- What is industry involvement?

- Will there be collaboration with other countries?
- Can Australia rely on Chinese R&D?
- Will innovations be shared with other countries?

Japan

Japan had significant research progressing but funding appeared to have been reducing.

The Forest and Forest Products Research Institute (FFPRI) was based in Japan, with funding from Governmental Grants. Their main aim was the promotion of sustainable forest management and resource utilization, through research on forest, forestry and forest products. There were 10 research centers or experimental stations, with research programs on biodiversity, conservation, forest protection, production, wood utilization, genetic engineering and forest policy.

A further study of the housing industry would have been required to fully understand the R&D process in this country if Japan had been selected for Phase 2 analysis.

European Union

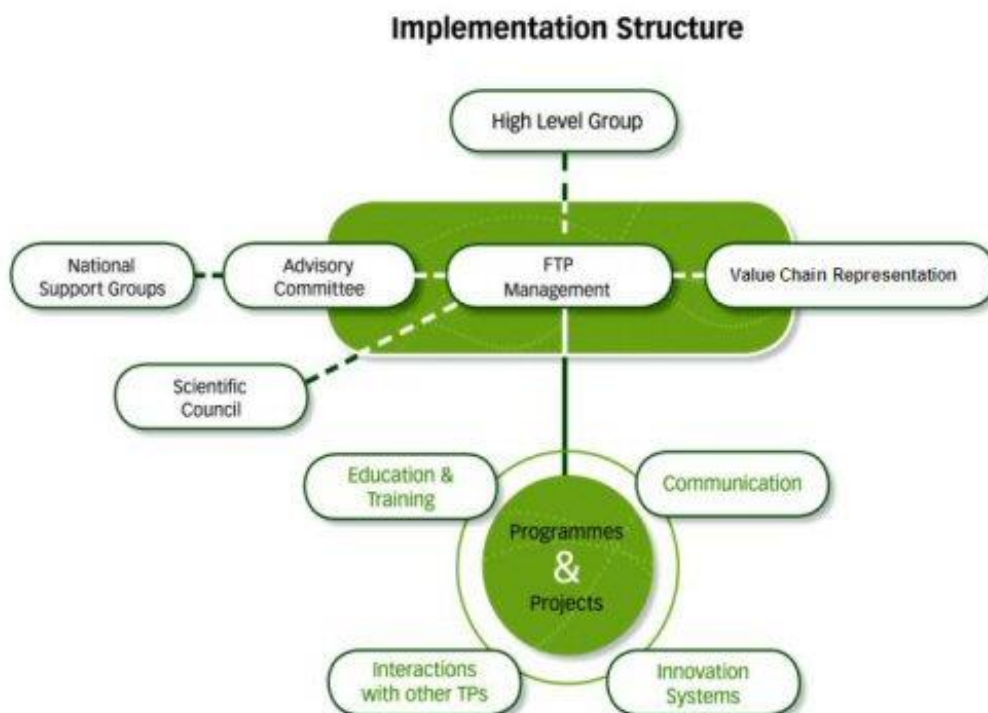
The European Union has major work progressing via the seventh framework program and in particular the Forest Based Sector Technology Platform (FTP).

The system is long term and innovative. It encourages collaboration and trans-national co-operation. Funding is from various sources to support R&D. Some national and state jurisdictions support further local and cross border initiatives.

The drivers in this program are industry and it appeared to have strong representation from member countries.

Diagram 3 below shows the implementation structure and the co-coordinating role of the management team. Industry is represented throughout the structure and national interests are channeled through the national support groups.

Diagram 3: Implementation Structure for the EU Forest Based Sector Technology Platform



Malaysia

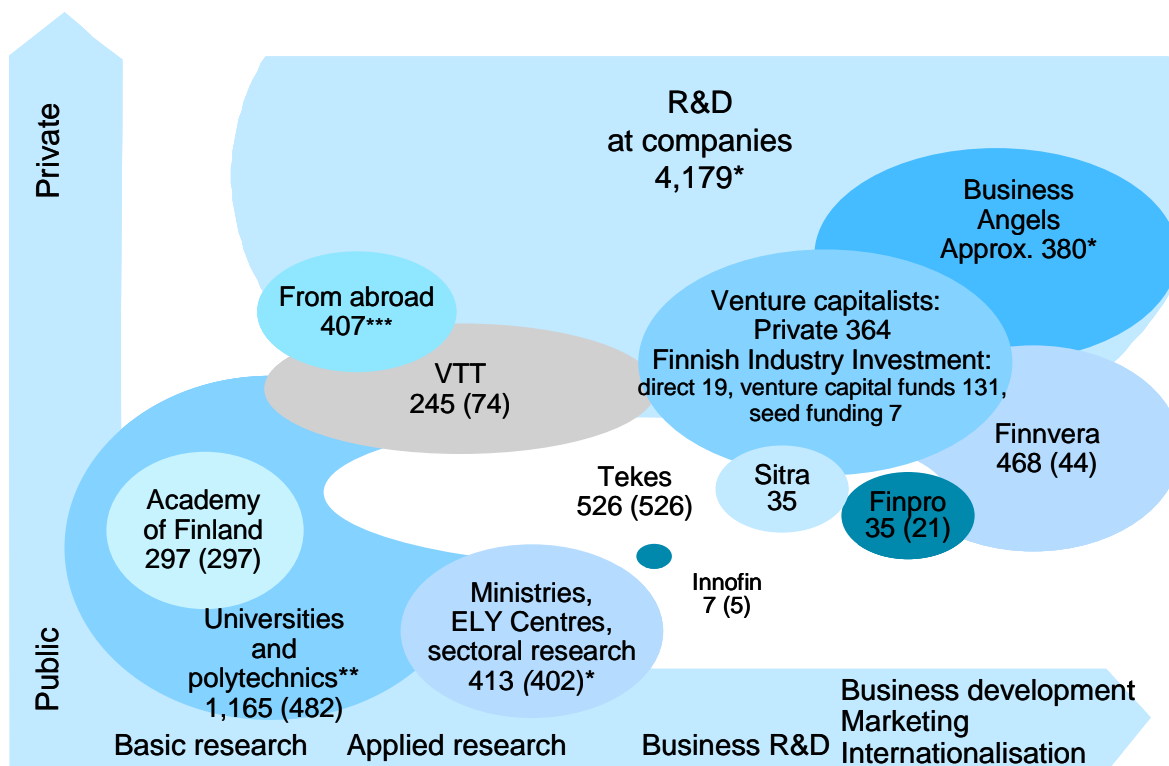
Malaysia is well endowed with large tracts of forests. It has an economy partly dependant on forestry. It also has both upstream and downstream industries which are well developed. Private sector also plays a major role in the industry in Malaysia. Major efforts are being put to strongly link these private sectors with the Research Institute and the Universities. These efforts have resulted in bridging the deficit in Government funding with private sector funding.

Finland

Finland appeared to have a structured R&D program across all industries. Examples of industry turnaround via R&D innovation are common. The most noted historical example is Nokia the forestry products and rubber company, converting to a mobile phone company. The R&D focus is strong in forest and forest products sector also.

The Diagram 4 highlights the R&D culture in the Finnish economy. There are many avenues to seek support on a national level. Opportunities for further support from the European Commission are available as well. These opportunities are exploited by Finnish organisations.

Diagram 4: Finland Research and Development Support Structures and Organisations



Note: Source Tekes. The Diagrams represent the total extent of each organisation in million euros in 2008; those marked with star are earlier. In parenthesis the share that is funded from the State budget.

includes polytechnics * includes R&D costs of corporations foreign units

To co-ordinate the strategy and national agenda for the forest and forest products sector stakeholders formed a company. This organisation co-ordinates and directs funding based on an agreed strategic agenda set by the industry stakeholders.

Germany

Germany has funding systems in the forest and forest product area. This system relies funding and support from industry and the Federal and State Governments.

There appeared to be more support for forestry research from public money whereas industry was a higher percentage of funding in the forest product area.

Also, the German sector takes full advantage of the EU Forest based sector Technology Platform (FTP). There are many examples of involvement and support of the FTP.

Korea

Korea was considered active in research, although industry funding appeared to be reducing.

The Forest Research Institute had a number of programs which were as follows:

- **Forest Tree Breeding**
 - Tree breeding of native species and development of useful exotic species through provenance, progeny and adaptation tests
 - Sustainable tree improvement based on the establishment of breeding strategy
 - Breeding for fast growing species and for resistance variety
- **Development of biomass production and environmental cleanup species**
 - Establishment of short-rotation forests for biomass production
 - Study on physiological and ecological characteristics of tree species
 - Research on Phytoremediation using forest tree species
- **Forest Resources development and overseas forestry**
 - Development of planting techniques and the functional rearing model of forests to improve carbon absorption sources
 - Improvement of added value through the development of clonal forestry technique and searching superior forest resources from overseas
- **Creation of a production base**
 - Establishment of integrated management system for systematic management and the environment-friendly technique development of forest roads
 - Establishment of labor reduction forest operating system and the improvement of work efficiency by localization of forest equipment

This structured approach and depth of cover was thorough.

Norway

Although not part of the EU, Norway takes advantage of the EU Forest based sector technology platform and national public funding systems with limited funds provided from industry.

There is a high level of collaboration with Sweden and other countries. Some additional national R&D funding is available in specific areas such as energy efficiency in the sector. There is a user friendly system of tax reduction on some projects.

It is worth noting that the forest owners in Norway have traditionally been politically influential in this forested country. In spite of the current oil wealth the forest sector remains as an influential industry lobby group. This assists in the development of some public funding programs.

Researcher projects are funded based on their classification:

- Basic research receives 100% public funding
- Competence-building projects with industry involvement receive up to 80% public funding. Industry funding must be in cash not in-kind resources
- User-driven innovation projects: Industry-owned projects receive up to 50% public funding. Industry funding may in this category be both in cash and in-kind.

United Kingdom

United Kingdom had a national research agenda and is active in the EU Forest based sector Technology Platform. Lack of venture capital to deliver innovation results appears to be a hindrance to drive further R&D expenditure in the sector in the UK.

Sweden

This Scandinavian country takes full advantage of the EU forest based sector technology platform. They also participate in Nordic programs. There is strong academic and research infrastructure within the country. They have high collaboration with other countries which delivers innovation and further funding advantages.

France has a substantial R&D program via EU and National funding. Industry support is limited. They have established a value chain concept across the entire sector that includes pulp, paper and bio products. The main effort was at the enterprise project level. Research institutes are substantial and attract both public and private customers and funding.

Austria appeared to be taking full advantage of the EU forest based sector technology platform with little additional support. Universities in Austria appear to have a strong influence on the research agenda as compared to other countries where industry is the driver. Collaboration on research and development is high between Austrian enterprises.

New Zealand appeared to be suffering from reduced funding from all sectors. New Zealand was once considered one of the best countries for forest research. Some of its past models may merit consideration. The level of public funding was high in the past to stimulate the industry development. There has just been another injection of significant public funding at the time of writing this report.

South Africa generally has modest funding. The level of national funding and industry funding is similar. A number of projects are in place. There were a number of areas of interest that could merit further investigation.

Ghana was active in the forest and wood products area and is working with other countries on long term projects. It is receiving some funding from outside its borders to add to limited local funding. There appeared to be a number of interesting programs to stimulate the sector.

Kenya has limited national funding and limited industry funding. It also works with other African countries and gets some financial support from outside its borders. A number of projects are in the progress.

Russia has 828 million hectares of forest and is considered the most forested country in the world.

Russia has established a national research agenda and is keen to take advantage of the forest technology platform cross border arrangements provided by the EU. They have developed a national research agenda for the sector. The three areas covered in this agenda are:

- Tailor made wood supply
- Forests for multiple needs
- Advancing knowledge on forest ecosystems

A process to reduce the list to a manageable group size

After a considered review of the jurisdictions above, including gathering input from various stakeholders as to which jurisdictions were considered better practice, a process of elimination was employed to reduce the group size to a more manageable group for further analysis.

The process of elimination considered aspects such as those listed below to come up with the final list for a more detailed review.

- Were they highly recommended?
- Was there evidence of success?
- Was the sector of national significance and importance?
- Was information available in the detail required given the short time frame?
- Was there global coverage in choosing the jurisdiction?
- Was there adequate differentiation?
- Was there evidence of co-operative research models?
- Was there a significant industry ownership or drive?

- Were there aspects of interest to the Australian industry situation?

It was decided to review one Nordic country as all three in the initial scan were of interest. The European countries reviewed and some of their neighbors were heavily involved in the EU Forest Based Sector Technology Platform so it was considered appropriate to review one EU country in continental Europe and to review the Forest Based Technology Platform from an EU perspective. It was decided to review one Asian country for global spread and based on the increased R&D spend China appeared interesting for such a review. North America was of interest and the reinventing of the Canadian system was worthy of review. The USA model was also of interest from the perspective of domestic growth.

Recommended jurisdictions for further analysis in Phase 2

- USA
- Canada
- EU
- Finland
- Germany
- China

Phase 2 - A more detailed review of the short list

Unites States of America

The United States is the world's largest producer and consumer of forest products. The industry is considered a vital contributor to the domestic economy, particularly in the rural areas where many saw mills and pulp and paper mills are located. Once considered a global leader the industry has continually been challenged by international competitors.

The Forest Products Industry Technology Roadmap provides a framework for reinventing and reinvigorating the industry through technological innovations in processes, materials and markets. These innovations were aimed at:

- Achieving operational excellence in the production of existing and new products
- Developing new value streams for wood resources and
- Assuring an ecologically sustainable, affordable domestic supply of wood and fibre stock

The Agenda 2020 Technology Alliance is an industry led partnership dedicated to collaborative partnerships that create innovation in the forest products industry's processes, materials and markets. It was established in 1994 in partnership with the Department of Energy to improve the energy efficiency in the industries manufacturing processes.

The Roadmap was developed with the support of the American Forest & Paper Association (AF&PA) Agenda 2020 Technology Alliance and the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Industrial Technologies Program. Its purpose was to provide the research communities and their funding organisations with information on the technical challenges and needs that are considered priorities by industry. The goal was to stimulate collaborative, pre-competitive research, development and deployment that will provide the foundation for new technology driven business models.

The Roadmap document was developed with input from industry, industry suppliers and research organisations. This work plus addition task groups have been co-ordinated by AF&PA.

Strategic Goals were established via this mechanism:

- Significantly improved productivity
- Technically superior workforce
- New biomass-derived products and materials
- Added value to society

Seven technology platforms provide focus for research development and demonstration RD&D:

- Advancing the forest bio-refinery
- Sustainable forest productivity
- Breakthrough manufacturing technologies
- Advancing the wood products revolution
- Next generation fiber recovery and utilization
- Positive impacting the environment
- Technologically advanced workforce

In the USA tertiary institutes have embraced the needs of industry and the opportunity of public funding to become quite strong players in the process. There are some very business oriented organizations in academia with sound business development strategies. Partnership work is delivering results and encouraging further opportunities.

Industry enterprises appear to be entrepreneurial in embracing opportunities especially in the biofuels area. There is evidence of partnerships being a more common collaborative technique rather than cross sector collaboration.

The industry has successfully worked in partnership with the U.S. Department of Energy through the Agenda 2020 program. Other partnership projects are also being conducted with the U.S. Department of Agriculture and the National Science Foundation. Industry-government partnerships help ensure adequate funding to achieve the goals.

Other funding and co-ordination mechanisms are evident in the USA but the Forest Product Industry Technology Roadmap appears to dominate the focus and activity.

Table 2 provides a summary of interesting aspects

Table 2: USA Strengths, Challenges and Results

USA	Interesting Aspects
Strengths	<ul style="list-style-type: none"> • Strong partnerships • Strong domestic focus • Federal Government support • Result oriented at the individual enterprise level • Academic support from strong organizations
Challenges	<ul style="list-style-type: none"> • International focus • Sector collaboration and cooperation

	<ul style="list-style-type: none"> • Strong domestic competitive behaviour • Short term results focus • Focus on energy may diminish attention to other industry needs
Results	<ul style="list-style-type: none"> • Seven Technology Platforms defined • Entrepreneurial pilot programs in progress. e.g. biomass handling, black liquor gasification • Academic involvement

Canada

The Canadian Council of Forest Ministers (CCFM) held a national review in 2008 of the institutional relationships among those who fund the acquisition of new knowledge, those who have the knowledge and those who need the knowledge. This review highlighted some continuing inefficiencies but acknowledged considerable progress had been made in the previous two years, particularly with the formation of FPIInnovations and the Canadian Wood Fibre Centre.

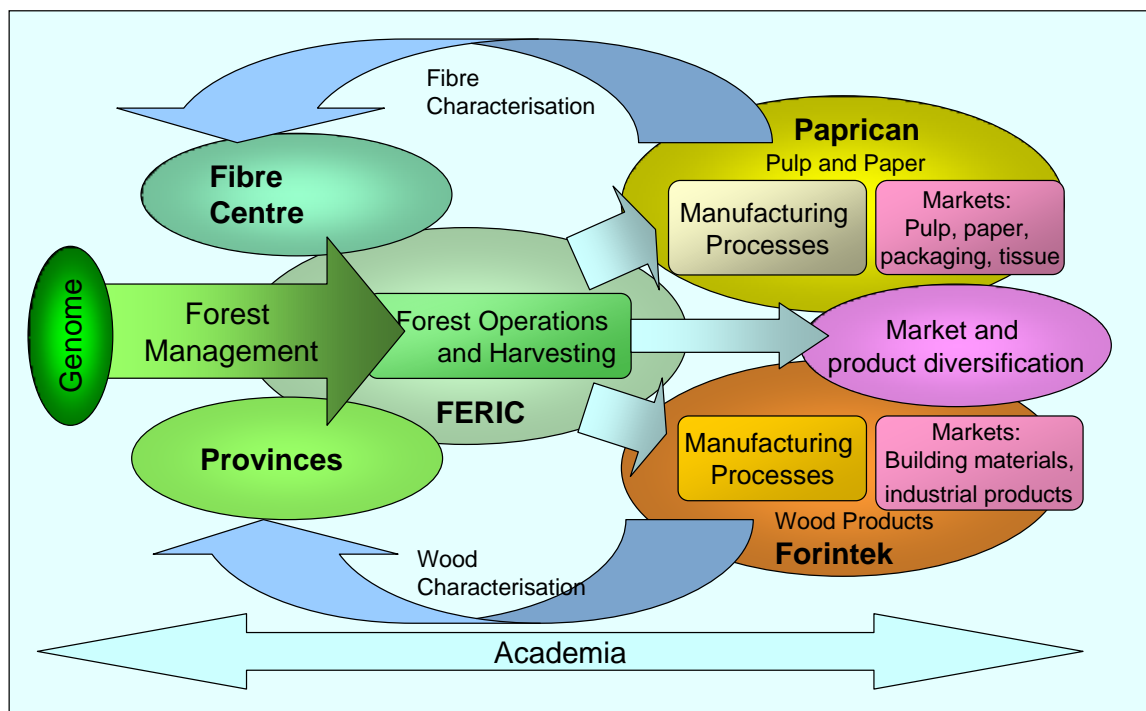
FPIInnovations was the amalgamation of the three national research institutes: FERIC, Forintek and Paprican; the largest private forest research organisation in the world. The fourth division of FPIInnovations is the Canadian Wood Fibre Centre, a virtual organisation within the Canadian Forest Service. The Fibre Centre focuses on economic opportunities for Canadian wood fibre and on the integration of the upstream with downstream to provide research along the value chain.

The Canadian Forest Sector Innovation Framework highlights that the key trends in research and innovation are integration and partnerships to bring together the institutions that fund research (governments, granting agencies, industry, financial institutes) with those who perform research (governments, universities, industry, research institutes) and those that apply research findings (Governments, primary and secondary industries, marketing entities and Non Government Organisations (NGOs)). This is particularly true for innovation as opposed to research.

In the Canadian forest sector the expenditure on research is equally shared between governments and industry. However industry is mainly concerned with manufacturing, while governments concentrate primarily on forest related research due to the predominance of Crown-owned forest land. This upstream/downstream divide resulted from Canada's unique forest research system with the industrial research institutes – Paprican, FERIC and Forintek – focused on manufacturing and the Canadian Forest Service (Natural Resources Canada) and certain Provinces with in-house capacity (British Columbia, Alberta, Quebec and Ontario) focused on forest sustainability. Universities cover the full spectrum.

The current value chain and the coverage of FPIInnovations can be summarized by the diagram below.

Diagram 5: FPIInnovations value chain



Feedback from industry stakeholders suggest that the FPIInnovations model has some problems and is not as robust as perhaps indicated by some publications. The general theme that comes through is that it is a good work in progress and has delivered some significant outcomes to date which includes:

- Development of academic strength at key Universities
- Research Projects in various areas which have delivered relevant commercial opportunities and process efficiency. Projects areas include:
 - Strand Moisture
 - OPTITEK Log Breakdown
 - Mountain Pine Beetle fighting plan and timber recovery
 - Precision Forestry Program
 - High Filler Fine Paper
 - Furniture customisation
 - Thinning effects on fibre quality

Table 3 below summarises the strengths, challenges and results of the Canadian model

Table 3: Canada Strengths, Challenges and Results

Canada	Interesting Aspects
Strengths	<ul style="list-style-type: none"> • Strong collaboration and co-operation • Strong domestic and international focus • Federal Government support • Results oriented • Academic support from strong organizations
Challenges	<ul style="list-style-type: none"> • Industry commitment to implementation of innovation • Provincial competition • Next generation talent development • Albeit a massive opportunity, some view China as the only market for R&D strategy • Funding requires continuous lobbying of Government and industry
Results	<ul style="list-style-type: none"> • Integrated organizations to reduce overheads and duplication • Academic development and involvement • Successful fund raising • Long list of achievements

European Union

European leaders wanted to address the paradox that often Europe has the necessary knowledge and research but fails to take these to market. The European Commission (EC) initiated or supported various initiatives to address this issue. One of these was the establishment of European Technology Platforms (ETP), private-public partnerships aimed at developing sectoral research and development programs in a more rapid and effective way.

The platforms are industry driven and primarily funded by the sectors themselves. The European Commission provides guidelines and facilitation, but is not a lead partner.

The forest-based sector seized the opportunity in 2004 and established the Forest Based Sector Technology Platform (FTP). The founding organisations, the Confederation of European Forest Owners (CEPF), the European Confederation of Woodworking Industries (CEI-Bois) and the Confederation of European Paper Industries (CEPI) represents the main value chains of the sector; forestry, wood and pulp and paper.

The FTP is supported by the entire forest-based sector in Europe. It is considered by many that this type of collaboration across forestry, woodworking, pulp and paper, bioenergy and specialities value chains is unique. The key stakeholders in the FTP developed a roadmap and 2030 vision.

“The European forest-based sector plays a key role in a sustainable society. It comprises a competitive, knowledge based industry that fosters the extended use of renewable resources. It strives to ensure its societal contribution in the context of a bio-based, customer driven globally competitive European economy”. (Source: www.forestplatform.org, FTP 2030 Vision)

A key document within the FTP is its agenda for future research and innovation known as the Strategic Research Agenda (SRA). The SRA was developed in a highly collaborative way involving many industrial, research and other stakeholders across Europe. Aspects from paper to packaging, from building with wood to bioenergy and from trees to forest management were considered.

The SRA lists key strategic objectives:

- Development of innovative products for changing markets and customer needs
- Development of intelligent and efficient manufacturing processes, including reduced energy consumption.
- Enhancing availability and use of forest biomass for products and energy
- Meeting the multifunctional demands on forest biomass resources and their sustainable management.
- Establishing a more efficient innovation system, including a better-structured research community with higher efficiency
- Establishing education and training schemes that meet high requirements
- Deepening the sector’s scientific basis, including taking advantage of emerging sciences
- Improving communication with the public and policy makers

The FTP collaborates closely with European Commission services and other funding agencies. The European Commission Framework Program (FP7 running 2007 2013 with a total budget of €57 billion) provides funding for research and development for all sectors. The previous system FP6 had little opportunity for the forest sector. Through the work of FTP increased the opportunity is available in the FP7 and the industry has secured significant EC funding as a result.

The FP7 is a major R&D funding source but funding from national and industry accounts form a larger part of R&D funding in the forest based sector. FTP look at the full range of funding opportunities and tries to create better synergy between national and international systems. FTP acts as a facilitator of research and innovation networking, bringing together research and industry partners. FTP also offers comprehensive information about funding programmes, policy, ongoing research and so forth. FTP also assists with sourcing EU funds for talent development via programs such as Marie Curie program.

FTP also displays cross sector collaboration and works with other ETPs such as Sustainable Construction, Recycling and Biorefineries. The FTP conferences included guest speakers from outside the Forest Based Sector to encourage collaboration and broader knowledge sharing.

Table 4: EU Strengths, Challenges and Results

EU	Interesting Aspects
Strengths	<ul style="list-style-type: none"> • Strong collaboration and co-operation • Strong focus on implementing the strategic objectives at the national level • Cross border work encouraged • Next generation talent development • International focus • Industry growth focus • Cross industry knowledge sharing • Global perspective
Challenges	<ul style="list-style-type: none"> • Bureaucracy • Cost (Financial & Time) • Ongoing budgeting not clear due to a reliance on in-kind support which could be withdrawn
Results	<ul style="list-style-type: none"> • Established cross border initiatives • Bio industry pilots • Recycling and environmental initiatives launched • Strategic agendas defined • Funding opportunities secured

Finland

Finland is known for its innovation in many areas and industries. There are many systems on a national level in both the private and public sector to promote and participate in R&D. This is highlighted in the Diagram 4 above.

The Finnish Government resolution in 2005 concerning the structural development of the public research system required that a national strategy to create and consolidate internationally competitive centers of excellence in science, technology and innovation (STI) be drawn up under the supervision of the Science and Technology Policy Council of Finland.

The Council accepted the strategy of Centres of Excellence in STI (CSTI) in 2006. The aim of the CSTI was to reinforce those fields of research and technology that were significant to Finland. It was also designed to create new national competence areas as well as to better respond to changing social and business needs for new knowledge, competence and innovation.

The objective of this plan was to lead Finnish-based enterprises, universities, research institutes and financing organizations to commit themselves to the activities and objectives of centres and allocate resources in the long term.

To maintain flexibility for different kinds of collaboration a non-profit limited company was chosen as the organization type. This organization for the forest and forest products sector was formed in 2007 and called the Forestcluster Ltd. This organization is owned by and has members from industry and research organizations. Industry members include machinery and chemical suppliers to the industry.

Forestcluster Ltd is responsible for the operation of the clusters CSTI. Its task is to initiate research and innovation programs and to channel research funds to selected focus areas.

The Finnish industry participated in setting the SRA for the FTP. Using this SRA as a guide the Forestcluster Ltd developed a national research agenda (NRA) for Finland. The objectives were:

- To double the value of the forest cluster's products and services by 2030 – half of the value coming from new products
- To double the cluster's R&D
- To increase the use of domestic wood by one-fourth
- Finland will continue to have the most profitable and sustainable global forest cluster. Its products and services are to be the most desired in the world. (Source: Forestcluster Ltd)

Table 5: Finland Strengths, Challenges and Results

Finland	Interesting Aspects
Strengths	<ul style="list-style-type: none"> • Strong collaboration and co-operation • Strong focus on national agendas • Next Gen Talent development • International focus • Industry growth focus • Strong political focus
Challenges	<ul style="list-style-type: none"> • Knowledge sharing • Competition with other industries
Results	<ul style="list-style-type: none"> • Forestcluster Ltd has developed strategies and priorities • Academic involvement • Engineered timber products • €40 million Intelligent and Resource-Efficient Production Technologies program launched in 2008. Two other programs launched in 2009.

Germany

In Germany the alignment of education and research at the universities has a long tradition. The universities for forest education are also centres of forest and forest products research. All universities for forest education and research are financed by the state (Bundeslaender); there are no private financed universities in this field.

Beside the forest research at the universities there are in Germany research centres for forestry with the primary task to assist the Federal and State Governments and the forest administrations. Such centres funded on the Federal level and on the level of the Bundeslaender.

The main Federal level institute, Federal Research Centre for Forestry and Forest Products, was reinvented in 2008 to become part of the Johann Heinrich von Thunen Institute (vTI). This is one of four German federal research institutes under the auspices of the German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV). The vTI was created on 1st January 2008 from the German Federal Research Centre for Fisheries, the German Federal Research Centre for Forestry and Forest Products and part of the German Federal Agricultural Research Centre.

Against the background of an increasing globalisation of wood production and trade, the Institute of Wood Technology and Wood Biology provides scientifically based guidance regarding forest and wood policy of the Federal Ministry of Food, Agriculture and Consumer Protection and adjacent policy sectors.

Major tasks are the quality assurance of wood and wood products with respect to consumer protection, the expansion of the technological capabilities for the increase of wood use, the material use of lignocellulosics as well as environmental and climatic aspects. The Institute takes part in the development of technical standards, testing standards and environmental product declarations and supports the teaching and training within the range of the forest and timber economy.

Research activities of the Institute are conducted in close collaboration with the Divisions of Wood Technology and Wood Biology of the Department of Wood Science of the University of Hamburg. Preferential subjects are:

- Wood structure, wood properties and wood quality
- Wood damages, wood preservation and wood drying
- Pulp, paper and wood based panels
- Building with wood
- Wood and environment
- Wood as chemical resource

The activities of this Institute are focused on biological, chemical, physical, ecological and economical issues in the context of the material use of wood.

Against the background of an increasing globalization of wood production and trade, decision support on a scientific basis is developed regarding forest and wood policy of the Federal Ministry of Food, Agriculture and Consumer Protection and adjacent policy sectors.

Research activities of the Institute of Wood Technology and Wood Biology are conducted in close collaboration with the Divisions of Wood Technology and Wood Biology of the Department of Wood Science of the University of Hamburg as well as with the other forest and wood-related institutes of the Federal Research Institute for Rural Areas, Forestry and Fisheries.

The German Forest based Research Agenda identifies research areas from a wider perspective beyond the interests of the sector. It is the result of a broad-based, multistage co-operative effort supported by several sector-wide working groups and characterised by a continuous exchange among numerous stakeholders.

The Agenda aspires to develop new forms of industry-wide, cross-sector co-operation involving partners from Germany and abroad as well as from other Technology Platforms – for the benefit of their economy, environment and society.

Implementation is aimed primarily at R&D activities and innovation processes spanning several branches of industry.

It also encompasses the transfer of research results to industrial practice. German or European funding schemes can generate only some of the resources required for implementation. Most measures will depend on corporate commitment and support. Innovative capacity is a key factor for the economic success of the forest-based sector. The sustainable, environment-friendly and future-proof use of forest-based eco-systems and their resources is the overall goal and benchmark of the German Research Agenda. Innovation strategies of the forest-based sector focus on three strategic priorities, each of which is subdivided into three research areas.

Climate Change – Mitigation and Adaptation

- Reliable findings about the effects of climate change and development of suitable protection and conservation concepts
- Flexible and implementation-oriented strategies to adapt to climate change
- Accumulation of greenhouse gases in products and raw materials and reduction in CO₂ emissions from production processes

Sustainable Supply of Raw Material

- Mobilisation and use of existing potential in rough timber and used wood as well as used paper products
- Assessment of competing uses and application of practice-oriented solutions
- Efficient use of resources through improved and ongoing recycling

Development of a Bio-based Economy

- Innovative and ecologically sound products and services
- Novel production technologies and processes based on the efficient use of energy and raw materials
- Socio-economic interactions involved in the development of a bio-based economy

The work of FTP in Germany is funded by the Federal Ministry of Education and Research as a co-operative project under the National Research Programme “Sustainable Forestry”. Project partners: Forest Research Institute of Baden-Württemberg (FVA), German Society for Wood Research (DGfH), Papiertechnische Stiftung (PTS)

Table 6: Germany Strengths, Challenges and Results

Germany	Interesting Aspects
Strengths	<ul style="list-style-type: none"> • Strong collaboration and co-operation • Strong focus on national agendas • Next generation talent development • International focus • Industry growth focus • Knowledge sharing
Challenges	<ul style="list-style-type: none"> • Competition with other industries • Domestic competitive behaviour • Bureaucracy • Appears to be lead by strong tradition funding bureaucracies and academic institutes
Results	<ul style="list-style-type: none"> • National agenda developed • Bio fuel pilot operations • Recycling initiatives launched • Redevelopment of main research group into new institute with various and supporting research institutes

China

The review of China's R&D co-ordination and funding for the forest and wood products industry posed three themes of questions:

- How big is the industry in this country given its reliance on imported fibre from Canadian and Russian forests and recycled paper from Europe and North America? Is there a perceived growth opportunity?
- If growth is planned where will the raw material come from?
- Is there a structured approach to develop the industry and involve private industry?

The first series of questions is addressed by the typical unimaginable scale that the Chinese State has been able to achieve in sectoral development in other areas. The Chinese Forest Industry Revitalisation is occurring on a massive scale.

At the end of 2009 five departments including the State Administration of Forestry, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Commerce and the State Taxation Administration released their plan for the revitalization of the forest industry 2010-2012. This was to serve as the foundation for an action plan to support the industry through the global economic crisis.

The plan aims to raise the output value of the sector and to maintain growth of around 12% annually. This was aimed to be achieved in 3 years by focusing on support for 100 national leading enterprises and 10 large wood industry clusters. The output value of the forest industry is set to increase from RMB1.44 trillion in 2008 to RMB2.26 trillion in 2012. The planned output of the wood-based panel sector will be around 100 million m³. The total value of wood products trade is expected to be over US\$90 billion of which US\$50 billion would be for export.

Export products such as wood-based panels, wood flooring, furniture, wooden doors were given priority. To meet these targets timber imports were forecast to be over 60 million cu.m (log equivalent). The number of employees in wood processing sectors is set to increase to 57 million from the current 45 million.

The question remained as to where the fibre would come from to support this growing industry. The answer is that China is spending \$US8.77 billion annually on its greening or tree-planting campaigns in an effort to have 20% of the country's land covered by forests by 2010.

Jia Zhibang, head of the State Forestry Administration, said in 2009, 16.66 million hectares of trees must be planted in the next two years in order to increase the forest coverage rate to 20%, from 18.21% achieved in early 2009.

People across China managed to create 4.77 million hectares of forests in 2008, a rise of 22.1% compared with that of 2007, according to statistics released by the National Greening Committee.

Output of the country's forestry sector is up 6.1% year-on-year. Forestry import and export volume was nearly \$US70 billion in 2008.

A total of 540 million people joined forestation efforts in the past year, planting 2.31 billion trees in mountains, city parks, on campuses and along highways and railways.

To address the final area as to whether there is a structured approach and cross sector involvement, we need to review the Forestry Bio-industry 4 Step Development Strategy.

The four areas of the strategy are:

- Vigorously promote the cultivation of forest biological resources. Continue to promote a forestation and social forestry projects to speed up the growth rate of forest resources by the year 2010
- Strengthen forestry bio-industry science and technology innovation. Rely on existing scientific research institutions, universities and related companies and projects as the carrier, to increase R & D efforts, and continuously improve the ability of independent

innovation. At the same time, research the implementation and conditions of construction, forestry biomass energy generation, biomass materials use. Also review the forestry agents and the establishment of a number of technical research and development centres

- The establishment of forestry bio-industry base which focuses on profitable biological resources, forestry, industry characteristics, advantages and good bio-technology economic development in the region. This is to be regionally led via centres of excellence to assist regional economic development. The regional leaders will play a key role in promoting the combination of research and continuous technological achievements to re-adjust the industrial structure, promoting the progress of science and technology in playing an important role
- Increase multi-channel bio-industry and forestry investment. Increase forestry bio-industry R & D investment in the necessary funds and preferential policies to promote technological innovation. Develop capital markets and encourage enterprises and private capital to enter the field of forestry bio-industry. Also guide social capital into the forestry bio-industry

This strategy displays a sound approach although; it is difficult to ascertain the level of involvement and ownership of industry to support this state approach of getting the job done. Based on evidence of achieving previous goals, it can be assumed that China will achieve its goals in the sector.

Australia may not be able to match the scale of the Chinese program or the alignment of all stake holders that they achieve within their borders, but the areas of focus appear very relevant for Australian forest and wood products industry development.

These areas of focus listed below are currently covered to varying degrees in Australia under a variety of programs but perhaps need strengthening:

- Plant more trees (not just plantations)
- Gain technical knowledge to strengthen the industry
- Develop the Next Gen technical talent
- Have a focused domestic and international market strategy
- Get Government departments aligned on industry needs
- Promote the importance of reforestation in both industry and society

Table 7: China Strengths, Challenges and Results

China	Interesting Aspects
Strengths	<ul style="list-style-type: none"> • Strong collaboration and co-operation • Strong focus on national agendas • Next generation talent development • International focus • Industry growth focus • Strong political focus
Challenges	<ul style="list-style-type: none"> • Knowledge sharing • Competition with other industries • Gaining technical knowledge from outside China • Forest area competing with farm land. Forest plantation land availability aligned with larger scale more efficient farming being developed
Results	<ul style="list-style-type: none"> • Developed strategies and priorities • Academic involvement • Projects delivered e. g. reforestation

A SUMMARY OF THE AUSTRALIAN SITUATION

Based on report - RD&E Strategy for the Forest and Wood Products Sector, National Primary Industries Research, Development and Extension Framework, February 2010, forest and wood products R&D is conducted in public and private organisations across Australia. Investment in such work can be divided into two broad categories:

- Forest R&D, which includes research mainly related to species selection and breeding, and the management and protection of wood-production forests, including plantations
- Wood products R&D, which includes research on primary wood conversion, product and market development (including paper products) and timber engineering.

In the 2007–08 financial year about \$59.6 million was spent on forest R&D and about \$26.8 million was spent on wood products R&D. If administrative costs are included, total expenditure was about \$104 million.

Since 1982 there has been an overall real decline in expenditure per unit area and per unit harvested wood volume. There has also been a decline in expenditure as a percent of industry turnover — from about 0.56% in 1994/95 to 0.47% in 2007–08.

Major funding sources in 2007–08 were:

- Australian Government (44% of total funding)
- State agencies (28.5%)
- Private sector (20%)
- Universities (7.5%).

Research undertaken on native forests and softwood plantations has declined in recent years, whereas that on hardwood plantations — which have been increasing significantly in area — has grown. Funding for wood products research increased in real terms between 2001–02 and 2007–08, due partly to investment in CRC Wood Innovations.

A number of bodies have been created to improve communication, coordination and representation in the sector, or within specific elements of the sector. Very few of these bodies have a primary focus on R&D, although they may deliberate on issues that impact on R&D.

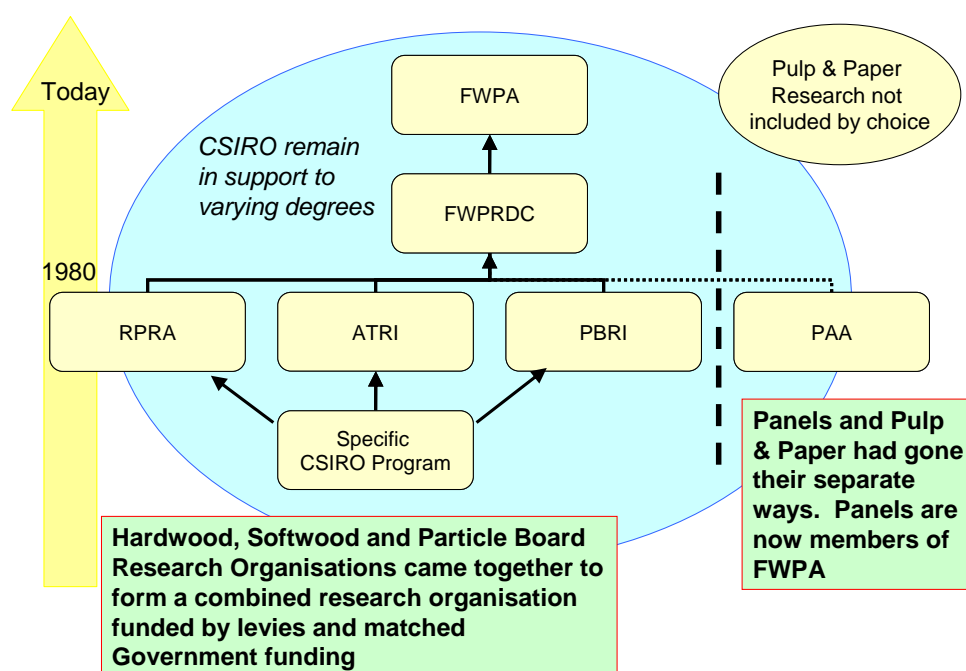
Intergovernmental policy coordination is conducted through the Forestry and Forest Products Committee (FFPC), which is a peak committee that forms part of the Primary Industry Standing Committee (PISC). PISC reports to the Primary Industry Ministerial Council (PIMC). In 2009 the Minister for Agriculture, Fisheries and Forestry established the Rural Research and Development Council as the Australian Government's key advisory body on rural R&D.

The Research Priorities and Coordination Committee (RPCC) reports to the FFPC and provides coordination of forest research conducted by State and Federal Governments and has strong links with other research providers. It advises the FFPC on research related issues, research needs and technology transfer relevant to maximising forest productivity and managing a range of forest values within the context of sustainable forest management.

In June 2008 the FFPC adopted a strategic directions document prepared by the RPCC, the aim of which is “to provide a clear statement of research needs to inform future research investment decisions in all areas of the sector”. It sets out a number of research priority areas. The RPCC manages a number of research working groups (RWGs) that consist of key researchers drawn from government agencies, universities, CSIRO and other research providers. It has traditionally played a research coordination role rather than a research planning or research policy role.

A key national body with a focus on R&D funding is FWPA, a not-for-profit industry-services company established in 2008. One of its key services is to identify, prioritise and provide funding for key R&D and capacity-building activities that have the widest benefit for the forest and wood products industry (domestic growers, processors and importers). FWPA’s mandate is determined by its members — wood processors, private and government forest growers, and Australian importers of forest products. FWPA operates four skills-based advisory groups covering the growing, processing and marketing functions of the sector (excluding pulp and paper).

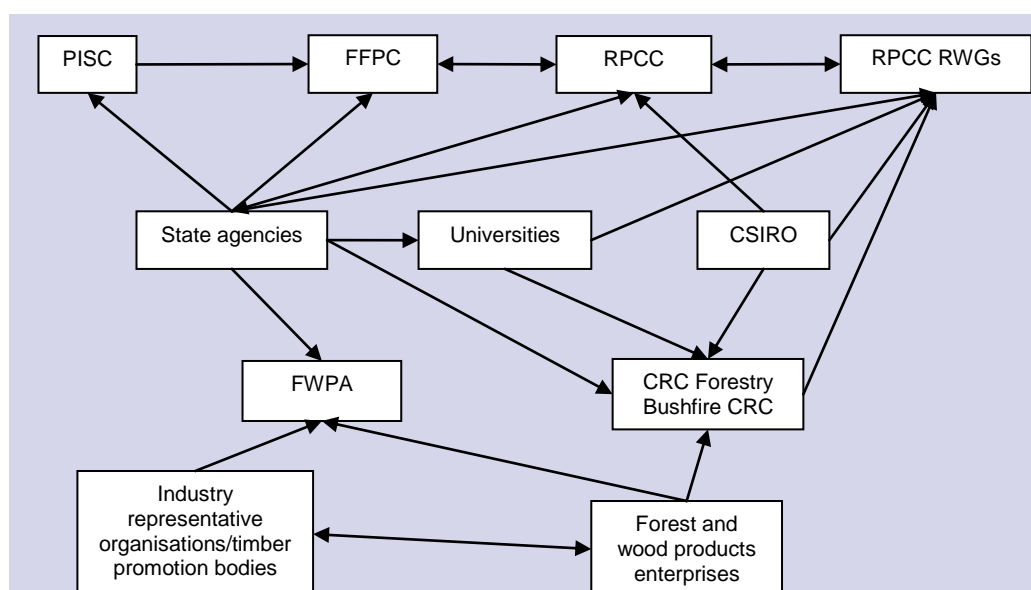
Diagram 6: History of FWP R&D Models in Australia



The Australian Government matches eligible R&D expenditure by FWPA subject to conditions specified in a statutory funding agreement. Total R & D expenditure by FWPA is less than 10% of the sector total, indicating that it is a less dominant player in funding compared to other jurisdictions.

Diagram 7 illustrates the existing network that facilitates the exchange of information between organisations. The Diagram shows that, while there are many options for coordination and collaboration, there is no single overarching body or group that provides policy and guidance for R&D at the national level. It also shows that there is no clear pathway for the flow of information that might be used in the development of coordinated R&D strategies.

Diagram 7: Interactions of RD&E providers through existing structures



Note: Directional arrows indicate the involvement of one entity type in another by participation in a board or advisory group.

Challenges facing the sector

Concerns raised in the National Primary Industry Report suggest the following challenges exist in the Australian R&D systems for the forest and wood products sector.

- The ageing, declining number and fragmentation of the R&D workforce
- Limited and declining capacity in the extension of R&D across the supply chain
- Apparent lack of acknowledgement in industry of the role of R&D in industry profitability and sustainability
- Lack of industry engagement with the community on the environmental costs and benefits of production forests
- Lack of industry engagement with the community on the environmental benefits of the full range of forest products
- A tendency to focus on short-term applied research rather than longer-term, more strategic research and a loss of long-term research sites as a result of restructuring
- Limited national-level coordination of R&D involving private and public providers, users and funders
- A lack of key performance indicators of R&D effectiveness
- The commodities focus of the wood-fibre-growing and processing sectors
- A lack of R&D coverage in some regions, especially the tropics
- Reduced policy focus and fragmentation of responsibility for forests, leading to declining support for production R&D

It the same report the following strengths were identified:

- Previous results of innovation, with the capacity to adapt to a changing resource and competitive environment
- Good regional coverage, with R&D resources in many of the major wood production areas
- A long history of forestry research, including investment in long-term forest sites
- A history of collaboration in wood products research
- High-quality research capability in some areas in the sector
- National coordination of Government-funded forestry R&D
- A diversity of R&D providers

These identified challenges and strengths were considered in the assessment of jurisdictions in the score card below.

METHODOLOGY AND ASSESSMENT OF THE JURISDICTIONS INCLUDING AUSTRALIA

A methodology to review the chosen few against the existing and a future Australian model was developed by the author to further distil the chosen few jurisdictions to the most attractive model for consideration.

This methodology was based on aspects of good R&D co-ordination models documented in various literature sources and industry experiences. These items of consideration of a good R&D system are explained below in Table 5.

Criteria for assessment

Each of the six jurisdictions were assessed against these criteria and given a score out of 10 for each item. Initially the system was tested by the author. The scores were then sanity checked by various stakeholders that had experience or knew more detail on each jurisdiction. The fine-tuned score after this exercise is shown in Table 8.

It is a subjective exercise due to the difficulty of comparing such different systems with different national and industry support mechanisms. In spite of this subjectivity the scoring did appear robust and highlighted some opportunities for Australia which was the objective of the exercise

Table 8: Assessment Criteria

Assessment Criteria	Explanation and typical question for criteria
Outcomes	Are results being delivered to strengthen the industry? These results may be direct or indirect through the enabling activities of the organisation.
Sustainability	Is the model sustainable from both a business and an environment perspective? Are the funding mechanisms secure or from multi-sources to allow ongoing activities?
Cost	Are the costs considered by the industry to be good value for the return?
Management time cost	Is the involvement of industry management considered value for effort? Is the system self directing once the industry has defined its needs and desired direction?
Collaboration	Is there evidence of stakeholder collaboration to support and deliver knowledge sharing and application of findings? Is the collaboration within the sector? Is it across borders? Is it across sectors?
Cost Sharing	Are costs being shared between all stakeholders- Government, industry, academia and the community?
Knowledge sharing	Is knowledge sharing evident amongst all stakeholders? Is knowledge sharing open to the sector globally? Is knowledge sharing balanced with intellectual property protection?

Cross sector synergies	Is there evidence of novel application of processes and knowledge with other sectors, e.g. fuel industry, steel industry, primary industry and chemical industry?
Talent development	Is there evidence of mechanisms and funding models to support the next generation talent development e.g. PhD programs, secondments with industry etc?
Risk sharing	Is there evidence that the associated risk of research is being shared with all stakeholders, i.e. no evidence of free riders?
Bureaucracy	Are the processes and mechanisms considered workable and free of unnecessary administration and bureaucracy?
National focus	For provincial or state systems is there a national focus on improving the industry sector?
International focus	Is there a focus to deliver results for an international market? Is there evidence of cross border knowledge sharing and acquisition?
Community considerations	Is there evidence of communication to and from the community to gather and include expectations in business plans?

Assessment results

Table 9: Fine-tuned R&D assessment score for each jurisdiction

Assessment Criteria	USA	Canada	EU	Finland	Germany	China	Australia Now	Australia Future
Outcomes	5	9	7	9	7	7	3	9
Sustainability	5	7	7	7	7	5	5	7
Cost	5	5	3	7	5	5	3	7
Management Time Cost	5	7	3	5	5	3	5	7
Collaboration	5	7	9	7	7	3	5	9
Cost Sharing	3	5	7	7	7	3	5	7
Knowledge Sharing	3	7	7	5	5	5	3	7
Cross sector synergies	5	7	7	7	7	5	3	7
Talent development	3	5	9	7	7	9	3	9
Risk sharing	3	5	5	7	5	5	5	7
Bureaucracy	7	5	3	5	5	3	7	5
National focus	9	7	7	7	7	7	5	7
International focus	3	9	7	9	7	5	3	9
Community consideration	5	7	9	9	7	5	5	9
Score	66	92	90	98	88	70	60	106

Based on the results of this process it was decided to focus on the top three scores of the six foreign jurisdictions to develop a model country (Australia Future) to assess the possible enhancements that could be explored by Australia to improve from the "Australia Now" position. In Phase 3 we look in more detail at the funding environments and models used in the three better practice jurisdictions of Finland, Canada and the EU.

The take away message regardless of the score levels in the table above is that we in Australia can improve significantly.

PHASE 3 - FUNDING AND STRUCTURE OF FPINNOVATIONS, THE FORESTCLUSTER LTD AND FOREST BASED SECTOR TECHNOLOGY PLATFORM

FPInnovations

The FPInnovations model is the only one under detailed review that includes not only the co-ordination of funding and national agenda; but also the hands on research work in its area of responsibility. The total number of employees in FPInnovations is in excess of 800 FTE. From an Australian point of view this model could perhaps be likened to a combination of A3P, FWPA and APPI, managing a substantial part of CSIRO.

FPInnovations has seen a 20% drop in funding from industry between 2007/2008 and 2008/2009. It is anticipated that this may not improve in the current year. This drop was due to the global market and financial situation and the reduced capacity and production from its member organisation. The business performance of members is linked to the member fees in FPInnovations. This drop in revenue prompted business cost saving initiatives plus a more heavy reliance on public funding. A number of public funding initiatives have been maintained which has assisted FPInnovations through these tough time.

Table 10: FPInnovations Funding Sources 2008/2009 Total Budget \$98 million (CAD)

Funding source	% share 2008/2009
Industry agreements	33%
Federal agreements	31%
Provincial agreements	12%
Industry member assessments	11%
Federal core contribution	5%
Provincial core contributions	3%
Other	5%

If we look more closely at one of the divisions of FPInnovations, FERIC for which the current years funding breakdown was available, we can further assess the funding program for the organisation

FERIC has more than tripled R&D activity since 1975. Increased funding to support this has been through recruiting new members and adjustment of the fee from 1.75 to 4.7 cents per cubic meter, adjustment in the Government of Canada contribution from \$1million to \$1.675 million (CAD) and new revenue sources such as provincial participation, contract research and grants.

Table 11: FERIC funding sources for 2010

Funding Source	% of share
Members	36%
Government of Canada	41%
Provincial Government	21%
Other	2%

Fees are assessed on Member Company's total use of wood for pulp and/or wood products.

For members without mills or harvesting operations membership fees will be negotiated taking into account the level of the company's forest activities. (Minimum fee is \$4700)

The basic assessment and the minimum assessment fee vary up or down based on a principle of shared investment, shared risks and shared gain.

On a quarterly basis a sector performance factor moves between 0.5 and 1.5 to ensure FPIInnovations fees are tied to industry fortunes. Reports suggest this factor is not working as designed due to disputes and time lags on actual sector performance.

Membership Assessment = Rate (\$/unit volume produced) X Assessable Volume X
Sector Performance Factor

As FPIInnovations is a not for profit R&D organisations fees are tax deductible for members. This implies an effective payment of only 33 cents in the dollar.

This real example highlights that a sound model must have multichannel funding mechanisms that support it through both the good times and not so good times. There is good financial support from industry and when industry is not performing due to national and global economy effects the public funding is maintained to allow the R&D support to maintain its capabilities and programmes to support industry through both the downturns and the upturns. This public support does not prevent the R&D organisation adopting continuous improvement in cost reduction and resource efficiency as demonstrated by FPIInnovations during the global financial crisis.

Forintek and Paprican have similar fee structure arrangement based on production or annual gross sales. Once again, during poor industry performance the funding from the public purse is maintained.

Most wood products companies in Canada and the United States qualify to join Forintek as members.

- For **Primary** manufacturers, membership fees are determined according to production type (lumber, panels and shingles) and volume
- For **Secondary** manufacturers (value-added wood products from secondary and tertiary manufacturing) fees are based on the value of annual gross sales
- Equipment manufacturers, chemical suppliers and other companies directly linked to the wood products industry are eligible to apply for supplier member status. Their fees are based on the value of their annual gross sales.

For Paprican, any pulp, paper or board producers can become members and their fees are based upon annual production. Paprican has a higher proportion of its income from Member Assessments than the FERIC and Forintek divisions.

The Canadian FPInnovations funding model appears to be robust, but does bring with it higher overhead costs. There is a general level of satisfaction by stakeholders that FPInnovations is achieving some good wins but needs to continuously strive for members, funding and demonstrated outcomes. This model has the highest public money support for its structure and overheads.

The Finnish Forestcluster Ltd

The key task of Forestcluster Ltd is to initiate research and innovation programmes and to channel private and public research funds to selected focus areas

The Finnish Forestcluster Ltd as mentioned is a co-ordinating body for the Forest and Forest Products Sector. This was not the case with FPInnovations who carried out the research as well.

The company is managed by a management team of two people, the CEO and the Research Director. In addition there is a Board of Directors that consists of the representatives of the shareholders. The Board of the Directors of the Forest Cluster Ltd will decide on the shared strategic research programmes and financing for them. A research committee plans and prepares research programmes.

The shareholders and the members of the in the company represent both business and research organisations. The shareholders are:

- Stora Enso Corporation
- UPM
- Metsäliitto Corporation, M-real Corporation and Oy Metsä-Botnia Ab
- Myllykoski Corporation
- Metso Corporation
- Kemira Corporation
- Ciba Finland Oy
- Andritz Oy
- Tamfelt Oyj Abp
- VTT Technical Research Centre of Finland
- The Finnish Forest Research Institute
- Lappeenranta University of Technology
- Helsinki University of Technology

- Åbo Akademi University
- University of Jyväskylä
- Helsinki University of Technology.

The budget for 2008 was 475,000 Euro. The expected long term annual budget is expected to be €35-70 million when research programmes in all priority areas have been launched.

Funding of research programmes comes from several sources. These are:

- The owners of Forest Cluster Ltd.
- Public funding (Tekes, Academy of Finland)
- EU 7th framework programme
- Strategic partners

In 2010 there are three research programmes underway. The programmes typically last for five years and have a total budget of up to €40 million.

To understand who are the researchers who may do the work we need to consider two Finnish organisations that appear to cover a significant portion of the type of work covered by the three divisions in FPInnovations.

In the Finnish environment there is the publicly funded Metla (Forest Research Institute) with an annual budget of over €50 million and about 800 staff that cover similar work to the FPInnovations, FERIC division plus some similar activities of the Forintek Divisions projects. The state owned VTT covers many research activities including building and pulp and paper. Funding for VTT's 2008 annual budget was about €245 million and the organisation had 1700 employees.

VTT appear to be more private than public in their style of operation their funding is sourced as follows:

- Basic governmental funding is about 30%
- Private sector funding is 30%
- Domestic public organisations such as Tekes provide about 25%
- Funding from abroad is about 15%, of which EU funding was €21 million in 2008, which was 8.5% of all income

The general system of R&D funding in Finland requires some explanation as this is the environment in which the Forestcluster Ltd operates.

The government funds around 23% of all R&D activity. Of this 23% Government R&D allocation, 60% goes to universities, around 25% goes to public research organisations (mainly sectoral research institutes) and around 13% goes to the private sector.

Higher education performs around 17% of all R&D activities. Most of the funding comes from various government sources, especially from the Ministry of Education, but also from the main public R&D funders, the Academy of Finland and Tekes.

The amount of foreign R&D funding was around 7% of all R&D in 2008. Most of the funding (67%) was directed to the private sector. Around 19% of the foreign funding went to universities and 13% to the public research organisations.

The private non-profit sector is relatively small, comprising only 1% of all R&D funding.

This complex interwoven funding opportunities and interlocking support systems may explain why the Forestcluster Ltd organisation was formed to co-ordinate and direct initiatives against a national agenda to deliver the tangible results. This lean co-ordinating responsibility appears to be a valuable asset to the Finnish system.

EU Forest-Based Sector Technology Platform

The EU FTP model is also lean, but it is a work in progress in strengthening what is perceived by users as a weak administration support. Otherwise it is considered by the industry to be a good model to attract funding and support from Brussels for industry innovation. There is a general attitude that you get back what you put in. This implies providing staff to support FTP to help the system deliver.

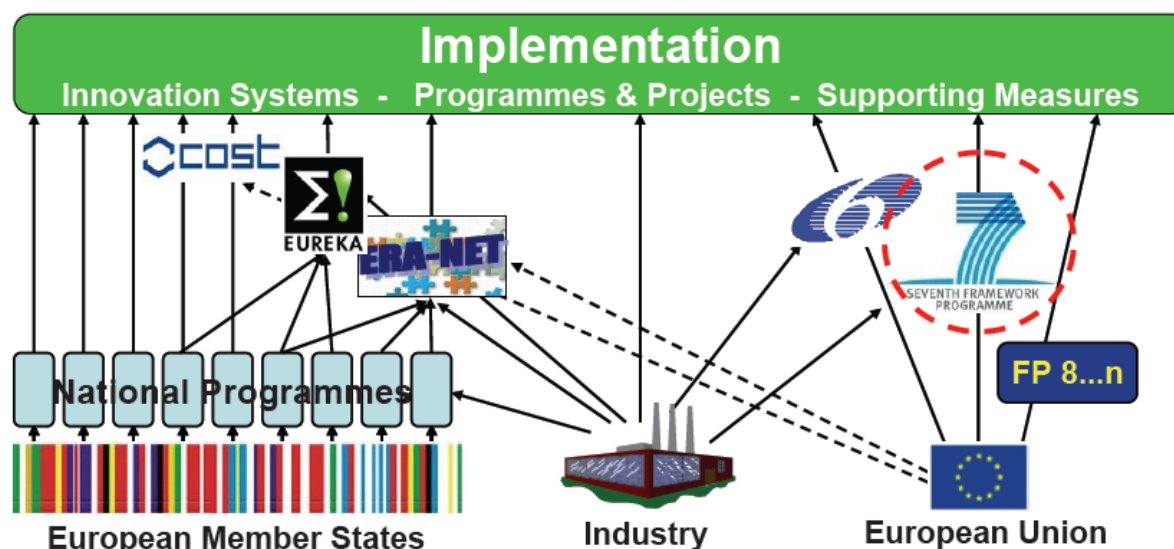
The daily operations within the platform are run by the FTP Secretariat, headed by a Director and a Manager. The coordinating work is supported by an FTP Management Group which brings together representatives of the value chains and core tasks such as communication and European Commission collaboration. The 'scientific conscience' of the FTP is represented by the scientific council. The FTP has also set up groups for Communication, Education and Training, and Innovation, as well as a number of Task Forces for pressing or emerging issues.

Since spring 2007, the FTP secretariat is based at the European Forestry House in Brussels, situated across from the European Parliament offices. The premises host a range of international forest organisations, including CEPF, EFI and EUSTAFOR. During the opening of the House, European Commissioner for Agriculture, Mariann Fischer Boel, commended the sector for taking yet another step towards much-needed collaboration and integration. The office has been provided via support from the German wood and paper industry organisations.

In the start-up phase of the platform, the European Commission provided essential financial support for getting the FTP up and running. However, as in the case of all ETPs, the FTP is industry-driven and it could not succeed without the financial support of the forest-based sector. Support has come in many forms. CEI-Bois, CEPF, CEPI and recently also EUSTAFOR have provided core funding for various management and other activities. Institutes and organisations throughout Europe have contributed in various ways, and not in the least by seconding their personnel to FTP meetings and activities. It is estimated that more than €3 million was mobilised for direct FTP activities during 2007. No budget was available to determine the exact operating cost of the organisation with support being offered in cash and in kind by the supporters. As the organisation is now a non profit enterprise in Belgium, annual reports will be available to assess the operating costs.

To understand the role of FTP we need to review the research funding options available to it to drive the implementation of its SRA objectives through its NSG. The historical Diagram below will aid this review.

Diagram 8: Funding sources for FTP implementation programs



Sources of funding can be obtained from the national programs of the member states plus the EC supported programs of COST, Eureka, ERA-net and other programs that encourage cooperation and collaboration between the member states.

COST is an intergovernmental framework for European Cooperation in Science and Technology, allowing the coordination of nationally-funded research on a European level. COST contributes to reducing the fragmentation in European research investments and opening the European Research Area to cooperation worldwide.

Eureka is a market oriented applied research program.

ERA Net is a cooperative research program that was so successful under the 6th Framework it was carried forward to the 7th Framework (FP7)

The other main source of funding is industry which matches public funding and also directly fund initiatives.

The third source of funding is from the EC directly via the FP7 program.

Similar to the Forestcluster Ltd the co-ordinating role in FTP to help the researchers access the funds to achieve the required European objectives is critical. Similar to the FPInnovations model there is a continuous drive to acquire funding from multiple sources to ensure security of funding through to extension and implementation.

Summary of learnings

In summary, the general theme which improved performance in R&D management in the sector was a strong commitment and drive by industry. Also, the ownership of the long-term development and sustainability needed to be with the industry, not the authorities or academia. All jurisdictions were aligned that strong academic institutions and support are a critical enabler, but not a driver. The other aspect was that strong Government support, both political and financial, is required. This financial support was via different mechanisms to ensure commitment and accountability by industry. Financial support was shared amongst

various sources. This share was able to move in percentage terms between industry and public based on national and industry economic performance over time. Lobbying and business development management was required to keep funding streams open regardless of whether they were provided from the public purse or the private sector. Successful models have dedicated business development managers from industry to drive funding availability and take full advantage of public money and tax incentives and also market the organisations to attract industry and private financial support.

There was also a common pattern in the better models of alignment between all stakeholders. There was a form of "co-opetition" in which industry players network and co-operate to help the industry become strong and sustainable, yet they still compete for business.

There is a common approach in many jurisdictions to include Pulp and Paper plus the new Bio Industries in the Forest and Wood (Forest) Products sector. This definition of the industry allowed better alignment and co-ordination of R&D Centres of Excellence. This concentration of technical force allowed better co-operation, knowledge exchange, better spending power, lower overheads and more tangible outcomes.

The other aspect also evident in some jurisdictions was the R&D focus in the sector towards understanding the tangible effects on the sector on climate change and the effect of climate change on the sector. From this understanding R&D was needed to develop and plan technical solutions to minimise industry risk and in some cases capitalise on the changing environment. The drive to help reduce the impact of climate change on society was also a consideration by the sector via this mechanism.

Next steps

This document presents a perspective of a better way to co-ordinate and fund R&D in the Australian Forest and Wood Products Sector. It is recommended that consideration be given to adopting or in some cases continuing themes evident in the jurisdictions of Finland, Canada and the EU model. The main theme is that the industry must lead and financially support the technical development of the sector. Government need to help with the appropriate support politically and financially. Academia must be developed and supported by both industry and Government. Technical talent development, including developing the next industry leaders, through R&D departments and organisations needs to also to be a consideration in justifying R&D spends.

Numerous people interviewed suggested that the next step after this scanning exercise should be an international best practice study tour. This group ideally made up of industry leaders and senior Government representatives could review the models on the ground to confirm the findings and tease out the practical strengths and weakness which are difficult to pinpoint from a remote study.

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Appendix 1: Co-opetition

An optimal R&D governance system is one that maximises the expected tangible and intangible outcomes for each and every stakeholder. To deliver these outcomes there is a desire for minimal monitoring, management activity, overheads and costs. Benefits and costs should be allocated appropriately to the stakeholders to ensure minimal free riding, synergies in knowledge sharing and acceptable commercialisation of developments.

The other less articulated desire from all stakeholders is - sustainability of business and discoveries through continuous development of technical competence and talent and maintenance of critical mass to ensure serendipity and enhancement of outputs via peer review and dialogue.

Co-operative Research is considered best practice to achieve the position mentioned above and is applicable to the situation of international market exposure and tough economic situations that the FWP sector finds itself in today.

Co-operative Research is where enterprises jointly acquire technical knowledge. There is an increasing trend on this type of research globally and it is across industries to combine knowledge strengths around a common theme or to attract additional financial leverage.

The current example around biofuel R&D highlights this combined effort approach.

- BP has been in a co-operative research program with Dupont to develop butanol BioFuel
- Weyerhaeuser has been in a co-operative research program with Chevron to develop forest based Biofuel.

Like for like industries also have developed toward more co-operative research with examples such as the Australian CRC model in use today.

Cooperative Research and Development is the intention of the current FWP R&D programs in Australia. The issue for this review is to consider if other jurisdictions are doing this better than Australia and thus offer a learning opportunity to improve. Some of the jurisdictions appear to be at the co-opetition stage.

Co-opetition

The ultimate in co-operation in the today's demanding international market is Co-opetition. Co-opetition— "a model in which a network of stakeholders co-operate and compete to create maximum value -- is one of the most important business perspectives of recent years. Internet and mobile technologies have made it even more necessary for companies to both co-operate and compete, by enabling relationships through information sharing as well as integrating and streamlining processes. In today's networked economy, co-opetition is a powerful means of identifying new market opportunities and developing business strategy."

Nalebuff, B. and Brandenburger, A., Co-opetition, Profile Books, 2002

Appendix 2 Author background

Howard Burvill has worked in operational roles in the forest products industry for over twenty seven years. He has worked in Australia, New Zealand, the United Kingdom, Norway and Chile. He has also done study tours and business/operational visits to Sweden, Finland, France, Spain, Italy, Austria, Czech Republic, USA, Canada, China, Korea, Thailand, Germany, Belgium, Netherlands, Brazil, and Denmark. He has extensive contacts globally in forest products sector.

He has experience in operations, technical sales and marketing, logistics and R&D. His last role while based in Europe was the Global VP R&D for Norske Skogindustrier ASA

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