Resource Wood

Implementation Plan of the National Research Programme NRP 66

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Content

What are National Research Programmes (NRP)?

The research carried out by National Research Programmes consists of targeted research that contributes to the solution of contemporary problems of national importance. Under the provisions of Article 6, paragraph 2, of the Federal Act on Research of 7 October 1983 (as of 1 March 2010) the Federal Council selects the topics and foci to be researched in NRPs and mandates full responsibility for implementing the programmes to the Swiss National Science Foundation (SNSF, Division IV).

Article 4 of the Federal Ordinance on the Federal Act on Research of 10 June 1985 (as of 1 January 2009) describes the purposes and contents of NRPs as follows:

"[1] *National Research Programmes are a means to direct and support coordinated research projects that have a common goal. Where needed, National Research Programmes should strengthen scientific research capacities.*

[2] *Topics of research are generally appropriate for National Research Programmes if:*

a. scientific research on the problem is of national importance;

b. Swiss research can make a significant contribution to the resolution of the problem;

c. solutions require research contributions from multiple disciplines;

d. the research goals cannot be met exclusively through basic research, through research within a specific section of the administration, or through industrial applications research;

e. research on the problem can be expected to produce research results that have practical applications within a five-year time period.

[3] *The following criteria should be taken into consideration in setting forth the topics of National Research Programmes:*

a. the programmes can provide the scientific basis for decision-making by government and the administration;

b. the programmes can be conducted with international collaboration and are also of great interest to Switzerland."

1. Summary

The aim of the National Research Programme "Resource Wood" (NRP 66) is the optimised management of wood as a resource across the complete cycle considering ecological, economical and social criteria. Relevant to this NRP are innovative technologies for material and energetic use of wood as well as future market developments. As a result of new research, strategies and technologies, a smarter use of wood as a resource is envisaged

Within this NRP, wood as a resource will be examined interdisciplinaryly with a focus on knowledge, problem solving and practical uses. It will be comprehensively examined from its microscopic to its macroscopic structures. The goal of the NRP "Resource Wood" is to develop strategies for improved resource availability, planning criteria and the ability to compete internationally. At the same time the scientific and technical preconditions need to be created so that the substitution potential of wood can be fully exploited. The holistic and synergetic approach will benefit all stakeholders along the value chains to a great degree.

NRP 66 is looking for solutions in six areas focussing on central aspects of the Swiss wood-based value chains (e.g. from forestry to wood products to chemicals to bio-energy): two modules are concentrating on improving the raw wood supplies and the monitoring of a sustainable cycle-management. The other four modules focus on the one hand on researching the resource from molecular to macroscopic levels to improve the performance and attractiveness of products, components and building systems. On the other hand, research is directed towards the conversion of wood into chemical products and energy which is relevant to fulfil its potential in terms of value addition and environmental impact with a view to a sensible cascaded usability.

NRP 66 is internationally well embedded and in tune with research activities in the EU. The programme reinforces international research collaboration while meeting concerns that are specific to the structure of the Swiss forestry industry, i.e. ownership and regulations.

Knowledge and technology transfer is a particular concern of the NRP. It will be achieved by an early involvement of small and medium sized businesses, of large companies as well as trade associations and targeted collaboration with the Innovation Promotion Agency CTI (www.bbt.admin.ch/kti/).

NRP 66 will operate with a overall funding of CHF 18 million. The duration of research is limited to 5 years.

2. Introduction

Many economies – all OECD countries without exception – are faced with the problem of increasingly scarce resources. An indication of this problem are rising prices for energy (both fossil fuels and electricity) and for raw materials (e.g. metals such as steel, copper and aluminium). The reason for this lies in the immense growth of emerging markets such as China and India while demand in developed countries has remained consistently high. At the same time we are experiencing the end of a period during which resources have been easily extracted without large investments. An example of this is the current peak in oil production coming to an end as the so-called "easy oil" is running out. We are also starting to experience more serious ecological problems globally (e.g. climate change), regionally (e.g. water shortage) and locally (e.g. storms, floods and mudslides). The simultaneous development of scarcer resources and climate change threatens economic development as well as regional and global security. Scientists, businesspeople and politicians are all looking for answers. Three strategies have come to the forefront:

_ Reducing consumption of current, primarily non-renewable, resources;

_ Increasing the use of renewable resources;

_ Increasing the efficiency of production processes.

2.1 A holistic assessment of an attractive resource

Wood is a renewable raw material created by nature with solar energy. The total timber stock in Swiss forests amounts to over 400 million m^3. The annual growth lies at about 10 million m^3 and therefore 8 million m^3 could be felled each year. However just over 6.5 million m^3 are actually used. This shortfall leads to unwelcome aging of trees. More intense management is therefore desirable. The Swiss forestry industries produce for the following sectors: 40 % wood fuel, 20 % construction industry, 30 % paper/cardboard and 10 % furniture/packaging/other (2008; FOEN, "Jahrbuch Wald und Holz 2010" (will be published by the end of 2010)).

Wood is a multifunctional material and has a high substitution potential for purposes in which oil and other non-renewable resources have been used so far. Wood has the potential to replace oil-based bulk chemicals (including the synthetic pharmaceutical agents that are produced from them) and plastics and to substitute a variety of other (building) materials without which the modern world would come to a literal standstill. Recent research in nanotechnology as well as in macro-technology is opening up new areas of application for wood.

Faced with the challenge described above, achievements in science and engineering are important but not sufficient. The findings and their application need to be made available to businesses (knowledge and technology transfer) and economic measures may need to be implemented along the value chains. This is a particular challenge for Switzerland since the forestry industry is far from being in an optimum position to face the challenges of the future: (i) many private and public forestry businesses are losing money because ownership is often fragmented. The structure of wood processing businesses is also very fragmented and is still run by small businesses; (ii) Swiss forests are not managed as intensely as possible which leads to aged and destabilised stocks; (iii) value addition in the forestry industry is underdeveloped, the balance of trade is imperfect; (iv) productivity and innovation incentives along the timber processing chain are low, particulary for broadleaf forests; (v) efficient product cascading and instruments for monitoring/control are missing; (vi) planning principles regarding future availability and quality are uncertain; (vii) conflicts of interest due to the many potential uses of wood itself as well as of forests can affect the availability and production efficiency of the resource in the medium term (wood as raw material for products, including chemical uses as well as energy uses; C-storage, nature conservation); (viii) climate determines the growth of wood and climate changes may affect amount and quality of wood. The challenge for industry is to react with technology to possible future changes in wood quality.

Research therefore needs to focus on developing strategies for improved resource availability, planning criteria and ability to compete internationally. At the same time the scientific and technical preconditions need to be created so that the substitution potential of wood can be fully exploited. They are indispensable if a high value addition is to be achieved. Research needs to look at the complete life cycle of wood and create the basis for an efficient transformation of knowledge into value creation (science to business) by applying relevant push-pull strategies.

In view of these challenges, the Swiss Federal Council decided on 24 February 2010 to launch NRP 66 and the Swiss National Science Foundation (SNSF) was mandated with its implementation. During the research duration of five years, NRP 66 operates with overall funding of CHF 18 million. The National Research Council elected a Steering Committee to take over strategic management of the NRP. The Implementation Plan has been approved by the Head of the Federal Department of Home Affairs on 30 November 2010.

2.2 National and international research environment

On a European level, the increasing importance of forestry resources led to the creation of the "Forest-based Sector Technology Platform" (FTP) in 2004. In 2006, the platform published the "Strategic Research Agenda" (SRA), its key document. European forest industry, research institutions

and other stakeholders all contributed to its formulation. It emphasises research areas which will contribute to the successful positioning of the various national wood-based value chains in the international context till the year 2030. The SRA is meant to foster transnational cooperation of industry and research with a view to developing and submitting research proposals within the European framework programmes. In a second phase after the publication of the SRA, countries were encouraged to formulate agendas reflecting the interests of their respective national wood-based value chains in relation to the European model. In addition to European cooperation, national research funding will remain irreplaceable to deal with issues specific to countries and regions. By now, 13 countries have published their national research agenda.

Switzerland also applied the European research agenda to national needs. During 2006, the "Innovations-Roadmap 2020" was converted into the research project "Wood Fibre 2020 – strategies and technologies for optimised use of forest resources". This was later submitted as a suggestion for a new National Research Programme (NRP). The NRP "Resource Wood" is therefore internationally well embedded and in tune with research activities in the EU while meeting concerns that are specific to the structure of the Swiss forestry and wood industries i.e. ownership, regulations and main use. Many research institutes linked to the ETH domain as well as Swiss universities and schools for applied science are already engaged in EU programmes and other international collaborations. Switzerland is well represented in the COST Actions of the forest-based sector and in European framework programmes. These contacts ensure a strong link between national and European research programmes.

The Federal Office for the Environment (FOEN) in cooperation with the Swiss Federal Office of Energy (SFOE), the State Secretariat for Economic Affairs (SECO) and other relevant partners have formulated a "Wood Resource Policy". A "Wood Action Plan" has been established to facilitate the target-oriented implementation of the "Wood Resource Policy". Ecologically and economically sound use of wood is to be prioritised in the implementation of the policy. Six objectives have been defined:

1. The sustainable and utilisable wood production potential of the Swiss forest is exploited to the full by an efficient Swiss forestry sector.
2. Demand for material wood products in Switzerland grows. In particular, the proportion of wood in Switzerland's building stock increases.
3. The energetic use of forest fuel wood, slash and waste wood increases.
4. The resource wood is subject to multiple and cascaded use.
5. The capacity of the wood value-added chain for innovation increases.
6. Coordination with other relevant sectoral policies and actors is guaranteed.

The following seven measures are deems priority measures: (i) base data, (ii) providing information and raising awareness among forest owners, (iii) providing information and raising awareness among the population, (iv) hardwood use, (v) further development of energy-efficient and high-volume timber construction systems, (vi) raising awareness of institutional end users, (vii) design and organisation of framework conditions, coordination with partners. FOEN has earmarked CHF 16 million for the "Wood Action Plan" in its budget for the years 2009 to 2012. In addition, the "Fonds zur Förderung der Wald- und Holzforschung" of the FOEN supports projects intending to improve the competitiveness of the Swiss forest and timber industry.

3. Goals of the research programme

The aim of NRP "Resource Wood" is the optimised management of wood as a resource across the complete life cycle considering ecological, economical and social criteria. Relevant to this NRP are innovative technologies for material and energetic use of wood as well as future market developments. As a result of new research, strategies and technologies, a smarter use of the resource wood is envisaged.

The NRP "Resource Wood" is therefore looking for solutions in six areas focussing on central aspects of the Swiss wood-based value chains (e.g. from forestry to wood products to chemicals to bio-energy): two modules are concentrating on improving raw wood supplies and on monitoring of a sustainable cycle-management. The other four modules focus on the one hand on researching the resource from molecular, submicroscopic (fibrils and fibres) to macroscopic levels to improve the performance and appeal of components, structures and building systems. On the other hand, research is directed towards the conversion of wood into chemical products and energy which is relevant to fulfil its potential in terms of value addition and environmental impact with a view to a sensible cascaded usability. A more efficient use of the resource wood will contribute to a sustainable management and climate protection measures.

The aim of the programme is to harness the capacities and competence of interdisciplinary research groups in Switzerland in order to find solutions that are based on sound science and technology. This can only be achieved if the various institutions establish close interdisciplinary collaborations. The focus will be on novel and original ideas in terms of science as well as in terms of technology and commercial implementation. There will be no funding for projects which aim only at incremental improvement of the state-of-the-art. In principle, there will be two kinds of projects:

a) projects with a formulated implementation scenario right from the start

b) exploratory "high-risk – high-reward" projects.

The newly acquired knowledge will be put effectively and efficiently into practice (knowledge and technology transfer). The transformation of knowledge into added value is a genuine aspect of the research programme. It will be achieved in close collaboration with small and medium sized companies in particular. Gaining scientific and technological knowledge is one aspect of the NRP. Another aspect are improvements in resource supply, planning and international competitiveness of the sector. Business partners and trade associations will work towards the knowledge transfer and the practical implementation of the findings in business and society so that the necessary structural adjustments can be completed in the near future.

Sustainable management of Swiss forests including issues of nature conservation and climate change is not topic of this research program, but there are overlapping concerns that have to be taken into account. As a basic information on future development and management of Swiss forests, results of the study "Holznutzungspotenziale im Schweizer Wald" (will be ready by the end of 2010) should be taken into account.

At the end of NRP 66 the following overall objectives should have been achieved:

_ A high number of relevant new technologies and products, systems and services and policies have been developed or are in the pipeline.

_ The financial volume of projects to be continued beyond the conclusion of NRP 66 is at least at the level of the annual budget of NRP 66.

_ Based on the results of NRP 66 several start-up companies (service based or patent heavy) have been formed or are in the process of being formed.

_ Research in Switzerland along the value chains has reached above critical size, formed competency networks, is internationally recognised and appreciated.

Therefore it is important:

_ To be strict about the highest scientific quality and potential for innovative application as selection criteria.

_ To support only projects with a verified application and implementation potential after the initial three years.

_ To get in touch with previously uninvolved research groups working in Switzerland and win them for the research challenges of the NRP 66.

_ To integrate industrial partners early on: first to discuss the application potential, then to define the target specification and to identify potential show stoppers, last to serve as commercial partner for implementation.

_ To enlist the support of steering committee members and experts at the CTI and at the FOEN to help researchers find appropriate commercial partners.

4. Main research topics

Many different approaches and solutions can contribute to a smarter use of wood. This implies a clear delineation of the actual field of research which is achieved with the focus on six key areas. These areas were determined both by the fields of competence in Switzerland and the needs of science, business and society in Switzerland. The six key areas correspond to the six research modules. Four modules explore wood as a multifunctional resource from a molecular to a submicroscopic and finally macroscopic scale. In addition there will be two modules which focus on meeting economic requirements (including the availability and the provisioning of the resource) and on life-cycle management. As a result of the needed interdisciplinary research approach, it is to be expected that a number of projects will touch on the research challenges of more than one module. Figure 1 shows the six modules.

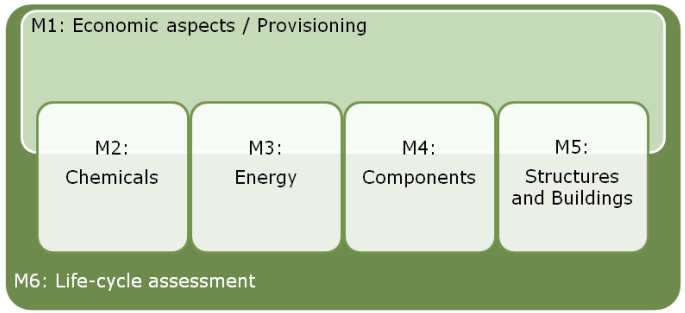

Figure 1: Modules of NRP 66

4.1 Economic aspects

The information about location and types of available wood is the basis for all modules of NRP 66. At the same time, new ideas and innovative technologies for material and energetic use of wood will have an impact on future market developments. The economic requirements are therefore closely linked to all projects within NRP 66 and a close interdisciplinary collaboration between projects in module 1 and the rest of the programme is crucial.

A holistic approach needs to inform all research into optimised uses of wood which respect demands for sustainability across the whole life cycle.

While current projects at the FOEN focus on sustainable management of Swiss forests, module 1 of NRP 66 is interested in projects and products which will influence economics and procurement policy.

Module 1: Raw wood – supply, policies and processes of provisioning

Research projects of module 1 should contribute to improving the availability of raw wood of the right kind and quality as well as developing and implementing alternative mechanisms to do business which in turn will improve the efficiency and acceptance of round wood allocation. New approaches based on resource-economy need to be investigated to improve general conditions and the management of raw wood provisioning. New approaches are also needed to handle the heterogeneity and variability of wood provisioning. Possible changes of quality due to climate change have to be taken into account. A central concern is the improved availability of the primary resource especially from small forestry holdings. Standardised and automated business processes should bring down transaction costs considerably. Procurement logistics need to be improved by employing "Operations Research" methods as well as sensor and information technologies. Processes of cooperation between market partners should be analysed to plan and control procurement processes. Another research aspect is the potential of electronic markets and new kinds of procurement rights that can be traded on the level of raw wood trade. Overall it is expected that these results will also contribute to shape new policies, systems and related measures that will significantly improve the boundary conditions and with that the competitiveness of the wood-based industries.

4.2 Wood as a key component of modern materials and as fuel

All projects of module 2 to 5 must take into consideration aspects of availability of raw materials as well as of sustainability with regard to the final products and the technologies and processes involved. Relevant hot spots need to be clearly identified in each project.

Module 2: Wood as a raw material for useful chemical substances

This module focuses on the conversion of wood by-products, leftover, used and in special cases virgin wood into high value products used by chemical and pharmaceutical industries as well as industries producing plastics and other composites. It will create know-how, instruments and technologies for fractionation and conversion to chemical products as well as new uses of wood-based raw materials like fibres and lignin-derivatives. This may include new methods for the disintegration of wood to cellulose, hemicellulose and lignin as well as new methods for catalytic degradation of lignin to phenol monomers. Work will be done to optimise the production of cellulose nanofibrils and other wood-based nanoparticles with both mechanical-chemical as well as biotechnological procedures. Due to their mechanical and chemical properties, nanofibrils are an ideal reinforcement element for nanocomposites. Research will also be done on chemical and biochemical methods for the improved and controlled disintegration of wood polyose which will need to be tested and developed. New methods for oxidation of lignin and optimised extraction processes for tannins and their further processing will also be explored.

Module 3: Wood as a source of energy

Sophisticated technologies, processes and systems are being identified and developed which allow the transformation of low quality, leftover and recycled wood into heat, electricity and, if feasible, fuel. This has to be achieved with the lowest possible emission of gases and ash particles and a high substitution effect with regard to fossil fuels. Other aspects to be considered are: primary and secondary measures to reduce emissions; the development of new concepts that permit a higher degree of process efficiency in electricity production; overcoming of technical barriers for new technologies (gasification, gas purification, process regulation); processing of fuel; energy recovery and optimisation of processes; system integration to achieve higher efficiency for the whole chain including the combined use of energy forms (heat, electricity, cold, fuel); evaluation of fuel potential with regard to existing or future technologies for energetic use and locations for large plants; assessment of the whole chain of processes in terms of energy and greenhouse emissions; identifying the supply chain with the highest energetic quality. The submission of system-oriented „high-tech“ projects integrating as many of the mentioned aspects as possible are highly encouraged by the Steering Committee.

Module 4: Wood as a material for components

The aim of this module lies in the development of a new generation of wood components with outstanding material properties (engineered wood products) and attractive manufacturing technologies and processes. This includes new and innovative composite materials as well as new ways of combining wood with other materials like glass and aluminium. New surface, gluing, bonding, protection and modification processes are developed for this new generation of wood components which introduce innovative and functional properties that add value (e.g. no moisture expansion, UV-stable, incombustible, low maintenance, self-cleaning, antistatic). It is important that these components are compatible with product cascading. The optimum usage of wood-based components demands exact knowledge of the raw materials involved. With a view to their future uses, the various types of wood are therefore being classified and analysed by applying new production processes.

Module 5: Wood-based structures and buildings

The use of wood in energy efficient building systems, a wide range of supporting structures, infrastructure and furniture is the most important use in terms of amount and value. It needs to be developed and become more competitive through industrial production and construction methods, alternative connecting techniques as well as risk management based on securing quality and reliability. Using wood as a construction material has environmental advantages which need to be assessed together with technical solutions regarding production technique and technical performance. Apart from optimised building materials, new construction forms and processes adapted to the new materials should be investigated. New systems are expected for multi-storey buildings, sport arenas, industrial buildings, bridges etc. Furthermore, the use of wood may not only play an important role in the construction of new building systems, but also during "green" renovation of existing buildings.

4.3 Life-cycle optimisation

The module on life-cycle assessment is a cross-sectorial module and the results achieved may be important to projects in all modules. It has to provide the foundation and the tools to deal with the "hot spots" identified in the other modules. In this module there will be therefore two main areas of research:

_ material flow models for future stocks and flows of wood in Switzerland;

_ assessment of technologies, development of tools for decision support.

Module 6: Life-cycle assessment of wood-based material flows

In close collaboration with other modules, the module develops the necessary decision-supporting instruments for a sustainable management of wood resources in Switzerland. Dynamic analysis of material flow patterns delivers information about the supply of primary and (importantly) secondary resources which have not been used efficiently so far. Based on this it will be possible to quantify more accurately the net C-storage of wood as material, bulk chemical and fuel while taking into account the substituted resources. Prospective life-cycle assessments estimate the effects of up-scaled technologies from other modules and, based on socio-economic methods, develop instruments for the holistic control and arrangement of resource uses and exploitations which are usable beyond the term of this research programme.

5. Practical significance and target audience

The NRP "Resource Wood" is based on the results of the "Innovations-Roadmap 2020" which was an initiative inviting all stakeholders of the national forest-based industries, trade associations, government departments and research institutes to determine the most relevant areas of research for the wood-based product chains. The aims of the programme contribute significantly to the "2000-Watt-Society" and the "1 Ton CO2-Society". The programme also supports research targets of the initiative "Wood Resource Policy", compiled by the Federal Office for the Environment (FOEN) with the help of the Swiss Federal Office of Energy (SFOE), the State Secretariat for Economic Affairs (SECO), the cantons and various trade associations and environmental organisations. Not included in NRP 66 is forest management, as this is covered by existing programmes of the FOEN. In all modules, the NRP "Resource Wood" raises new questions that were not asked explicitly before in the context of the national use of wood (e.g. chemical use, module 2).

Knowledge and technology transfer is a particular concern of the NRP. It will be achieved by an early involvement of small and medium sized businesses, of large companies as well as trade associations and targeted collaboration with the Innovation Promotion Agency CTI. This ensures that viewpoints of the industry are considered in the relevant aspects of a research project and that R&D results can be implemented in the practical sphere in an appropriately staggered way (push-pull approach)

At the same time, the NRP underpins teaching at universities and schools of applied science with a view to the forest-based value chains and their potential in the areas of construction material, source of fibre, chemical raw material and fuel. The NRP therefore creates a strong scientific basis in hard sciences, environmental sciences, engineering and economics geared at wood-based ecological business.

6. Programme flow

NRP 66 will be carried out as a cooperation programme between the Swiss National Science Foundation and the Innovation Promotion Agency CTI.

During the two stages of NRP 66, the research projects will be funded by the SNSF. The first stage, lasting three years, will offer the possibility of "high-risk-high-reward projects". At the second stage, to last no longer than two years, SNSF will fund only projects with a high potential for practical application (including the systems, services and tools developed within modules 1 and 6) or a good chance to become an industrial collaboration project funded by CTI.

After the conclusion of NRP 66, the application-oriented projects with a high implementation potential will have to be funded by CTI and industrial partners. The transfer of a NRP 66 project to an industrial collaboration project funded by CTI can take place at any stage of NRP 66, provided that the time is right for the project in question.

7. Submission procedure and project selection

The Implementation Plan as well as forms, rules of procedure and instructions for the submission on the *mySNF* portal can be found on the following website: www.snf.ch.

In order to organise the programme effectively and to define appropriate priorities, a two-stage submission procedure has been set up: pre-proposals are to be submitted first, followed by full proposals. Both the pre- and the full proposals must be written in English for screening and evaluation by a group of recognised international experts.

Pre- and full proposals have to be submitted online on the *mySNF* portal. For the use of *mySNF* prior user-registration on the homepage of https://www.mysnf.ch is required. Previously opened user-accounts are still valid and provide unlimited access to all the funding instruments of the SNSF. To submit proposals in time, a new user account has to be opened two weeks before the submission date at the latest. The submission of the documents by postal delivery is only accepted in exceptional cases after consultation with the programme coordinator.

The proposed research projects are required to follow SNSF guidelines and must be limited to a period of no more than 36 months.

Collaboration with research groups in other countries is highly appreciated, provided the planned cooperation brings significant added value or substantially enriches Swiss research in respect to content or methodology. Decisions on possible (co-)financing with research projects abroad will be made on a case-by-case basis. In the framework of NRP 66, the Austrian Science Fund (FWF) agreed to participate in the lead agency process as defined by the DACH-agreement, provided that the Austrian part of the project qualifies as basic research. The German Research Foundation decided that the lead agency principle will not apply to NRP 66 and its projects.

7.1 Pre-proposals

Interested researchers will first submit a pre-proposal. Deadline for the submission is 1 March 2011. The pre-proposal should give information on the following issues:

Data to be entered directly on the *mySNF* portal:

_ Basic data and abstract,

_ National and international co-operation,

_ Budget: Estimate of financial support required for salaries and running costs.

Documents to be uploaded in a PDF format:

_ Research Plan

- Research topic and objective of the project,
- State of research,
- Approaches and methods,
- Timeframe and milestones,
- Expected use and possible application of results; specific risks to be considered,
- List of five publications considered relevant as stepping stones for the research envisaged,
- List of your and your team's five most important publications and/or patents.

The Research Plan must be submitted using the template document provided on the *mySNF* portal. The project description must be in English and should not exceed six A4 pages.

_ Short Curriculum Vitae of a maximum of two A4 pages of all applicants.

All the proposals should point out possible scenarios for a successful industrial exploitation and assess the chances of success of the project within the given framework. The Steering Committee will obviously put less emphasis on these issues in the evaluation of "high risk – high reward"-projects (cf. chapter 3).

Furthermore the applicants should outline which kind of cooperation with industrial companies is envisaged during the different phases of the project (e.g. partner for the validation of market opportunities, partner to define target specifications, partner for commercial implementations).

The Steering Committee evaluates the submitted pre-proposals and makes a final decision based on the review criteria outlined below.

7.2 Full proposals

In the second stage of the submission procedure, the Steering Committee will invite the authors of the selected pre-proposals to submit detailed full proposals online on the *mySNF* portal (see above) corresponding to standard SNSF rules and guidelines.

All full proposals will be subject to international peer review and the principal investigators will be invited to present their projects to the Steering Committee. This procedure allows the Steering Committee to query specific points and ask detailed questions. Following the presentations, the Steering Committee will convene to select the projects to be recommended for approval or rejection by the National Research Council (Division IV; Presiding Board).

7.3 Selection criteria

Pre- and full proposals will be reviewed on the basis of the following criteria:

_ **Scientific quality and originality**: Pre- and full proposals should fulfil international state-of-the-art criteria with respect to scientific quality and originality as well as methodological standards. Furthermore, they have to contain innovative components and to be clearly different from running projects.

_ **Feasibility and compliance with the goals of the NRP 66**: Proposals should reflect the programme's scientific objectives and comply with its overall framework.

_ **Interdisciplinarity**: Interdisciplinary projects are strongly encouraged by NRP 66. The proposals must make it clear how they plan to assure meaningful interdisciplinary cooperation between research institutions and involvement of industry partners along the complete value chain.

_ **Application and implementation**: Potential for practical application and implementation of results are key elements of National Research Programmes. Projects of high practical relevance are therefore given high priority. Projects classified as exploratory "high-risk-high-reward" project may not need to show an imminent application potential for the first phase of NRP 66.

_ **Personnel and infrastructure**: Projects have to be carried out in a setting that provides adequate infrastructure and personnel.

The Administrative Office of Division IV checks fulfilment of formal criteria before the proposal is passed on for content review (cf. grant regulation of SNSF). Applications that do not satisfy these formal criteria will not be processed further.

7.4 Schedule and budget

The following schedule has been set for NRP 66:

Call for pre-proposals	8 December 2010
Submission for pre-proposals	1 March 2011
Invitation to submit full proposals	End of May 2011
Submission of full proposals	31 August 2011
Final decision on full proposals	December 2011
Start of research	1 January 2012

NRP 66 will operate with a total funding of CHF 18 million. The provisional allocation of this funding to different types of activities is as follows.

Modul 1 Provisioning	CHF 1.7 million
Modul 2 Chemicals	CHF 3.5 million
Modul 3 Energy	CHF 2.5 million
Modul 4 Components	CHF 3.5 million
Modul 5 Structures and buildings	CHF 2.5 million
Modul 6 Life-cycle assessment	CHF 1.6 million
Implementation and administration	CHF 2.7 million

7.5 Contact information

For questions concerning the submission and evaluation procedure or NRP 66 in general, please contact the programme coordinator Barbara Flückiger Schwarzenbach at nfp66@snf.ch or 031 308 23 40.

Contact person in financial matters is the division IV head of finances Marcel Schneider, mschneider@snf.ch or 031 308 21 05.

8. Actors

Steering Committee

Dr. sc. techn. Martin Riediker (President)

Prof. Dr. Charlotte Bengtsson, SP Trätek, "Wood Technology and wood in construction", SP Technical Research Institute of Sweden, Borås, Sweden

Prof. Dr. Alain Dufresne, Ecole d'ingénieurs en sciences du papier, de la communication imprimée et des biomatériaux, PAGORA, Institut polytechnique de Grenoble, France

Prof. Dr. Birgit Kamm, Forschungsinstitut Bioaktive Polymersysteme, Teltow, Germany

Dr. Jakob Rhyner, WSL Institute for Snow and Avalanche Research SLF, Davos and United Nations University (UNU), Vice Rector in Europe (UNU-ViE) and Director of the UNU Institute for Environment and Human Security (UNU-EHS), Bonn, Germany

Prof. Dr. Liselotte Schebek, Fachgebiet Industrielle Stoffkreisläufe an der Technische Universität Darmstadt und Institut für Technikfolgenabschätzung and Systemanalyse am Karlsruher Institut für Technologie, Germany

Prof. Dr. Alfred Teischinger, Institut für Holzforschung, Universität für Bodenkultur BOKU Wien, Austria

Prof. Dr. Philippe Thalmann, Laboratoire de recherches en économie et management de l'environnement, EPFL

Delegate of Division IV of the National Research Council

Prof. Dr. Nina Buchmann, Institute of Plant, Animal and Agroecosystem Sciences, ETH Zurich

Programme Coordinator

Dr. Barbara Flückiger Schwarzenbach, SNSF

Implementation Officer

N.N.

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