S2Biom

Delivery of sustainable supply of non-food biomass to support a “resource-efficient” Bio-economy in Europe

www.s2biom.eu




S2Biom Project

Project overview

The S2Biom project supports the sustainable delivery of non-food biomass feedstock at local, regional and pan-European level through developing strategies and roadmaps that will be informed by a “computerised and easy to use” toolset with updated harmonised datasets at local, regional, national and pan-European level for EU28, Western Balkans, Ukraine, Moldova and Turkey.

This target will be reached by relating most relevant information from recent and on-going EU projects with the results of a set of carefully selected validation case studies and in concise collaboration with key stakeholders from policy, industry and markets.

The project fits under the overall umbrella of the Europe 2020 strategy for the building of a bio-economy, as well as the targets for deployment of renewable energies and reduction of greenhouse gas emissions.

The project will build-up a concise knowledge base both for the sustainable supply and logistics of non-food biomass (quantities, costs, technological pathway options for 2020 and beyond), as well as for the development of technology and market strategies to support the development of a “resource efficient” bio-economy for Europe.

Project Activities

The research work covers the whole biomass delivery chain from primary biomass to end-use of non-food products, including logistics, pre-treatment and conversion technologies. All these aspects together will be elaborated to facilitate the integrated design and evaluation of optimal biomass delivery chains and networks at European, national, regional and local scale, in order to support the development of strategies for best ways to realise a bio-based economy.

The project activities will be implemented in three individual but strongly interrelated Themes.

Theme 1 - Methodological approaches

A key issue of the S2Biom analysis is to build up a concise knowledge base both for the efficient resource mobilisation (sustainability criteria, costs, logistics, availability) and for the assessment of resource efficient biomass value chains (with a set of consistent technical indicators).

Theme 1

will focus on methodological approaches, data collection and estimation of sustainable biomass potentials, resource efficient pathways and optimal logistical supply routes as well as the development of a computerised toolset. The work outputs, apart from the toolset will include fully populated databases at local, regional and pan-European levels as well as manuals for their operation, maintenance and updates.

- **a. Sustainable biomass cost – supply assessment**
- **b. Identification of existing and future biomass conversion technologies**
- **c. Identification of optimal logistics for sustainable non-food biomass feedstock delivery chains**
- **d. Development of a toolset for interactive biomass supply – demand matching in sustainable biomass value chains**

a. Sustainable biomass cost – supply assessment

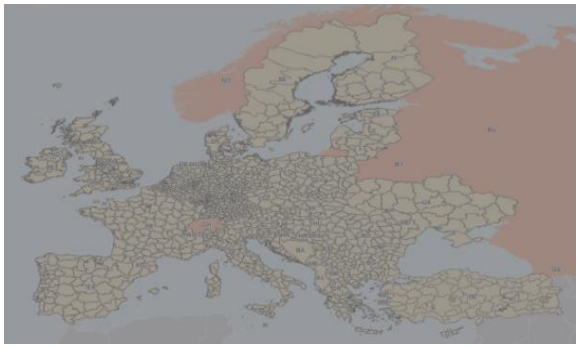
The objective of this activity is the identification of current and future potentials for sustainable supply of domestic solid biomass and of imported biomass for the region of the EU and the Energy Union.

Consequently, the Consortium will invest relevant efforts in setting-up a database building upon updated and improved information on sustainable biomass cost-supply. In order to enable the envisaged scenario differentiation by two levels of sustainability constraints, two sets of potential supply data will be prepared, one considering a basic set of sustainability constraints, and the second considering more restrictive sustainability constraints. The database will furthermore allow a sensitivity analysis of the impacts of specific constraints on cost-supply forecasts.

Spatial scope	EU28, Albania, Bosnia-Herzegovina, Former Yugoslav Republic of Macedonia, Moldova, Montenegro, Serbia, Kosovo[1], Turkey, Ukraine
Minimum mapping/ statistical unit	NUTS 3 2013 statistical areas for EU28 Spatial units of similar extend in the countries outside of EU28
Thematic scope	Domestic cost & supply per detailed category Imports for most relevant categories
Attributes on cost and potential supply per category (> 40 domestic supply categories)	Cost in €/tonne or €/ m³ respectively Potential supply in tonnes or m³
Temporal coverage	2012 2020 2030

This database will allow the determination of cost-supply potentials per spatial unit, with assumptions on current and future price levels (2020, 2030). It will further be used for a set of spatial web portal tools and as input to models that aim at supporting the decision making process on the utilisation of the sustainable biomass feedstock.

Along with that, S2Biom will develop methods and will demonstrate improvements for cost-supply data base generations in the future after the project ends with a focus on supply from forests and integration of remote sensing data and demonstration areas in the Upper Rhine Valley and the Voivodina Region.



[1] This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence

b. Identification of existing and future biomass conversion technologies

The work in this activity focuses on identifying and extensively characterising existing and future non-food biomass conversion technologies for energy and bio-based products, developing a standardised methodology for the characterisation of different biomass categories, and the optimal matching of biomass categories of different quality with the existing and future non-food biomass conversion technologies.

The suitability of a biomass type for a specific conversion technology is determined by different parameters that cannot be directly deduced from the current ligno-cellulosic biomass classifications used in biomass resource assessments. These biomass availability studies determine available volumes of biomass on sector level, rather than on its suitability for conversion. In order to maximise the biomass resource utilisation rate, the biomass types should be classified according to their suitability for conversion systems.

The conversion technologies in the S2Biom were divided into 3 main categories:

- Thermal conversion
- Anaerobic digestion
- Biochemical conversion

Each category is then divided into subcategories.

In order to match biomass types with conversion technologies, the fundamental biomass characteristics which determine the value of biomass for a conversion system must be identified. Based on expert judgement, the most relevant characteristics per conversion category are identified.

Chlorine content: a characteristic to determine the suitability of a biomass type for combustion (thermal conversion).

Chlorine content, Cl% DW basis	Corrosion risk	Suitability	Classification
< 0.02	Very low	Most desirable	1
0.02 – 0.1	Low	Desirable	2
0.1 – 0.4	High	Undesirable	3
> 0.4	Very high	Very undesirable	4

If for example the chlorine content of a biomass type is between 0.02-0.1 (Class 2), the corrosion risk of the boiler during combustion is low making the biomass suitable for this conversion technology. If on the other hand the biomass is in class 4, it will not be suitable for combustion. In this case either other conversion technologies will be searched or changes to adapt to desirable combustion must be implemented. This change can include pre-treatments, additives, boiler specifications etc.

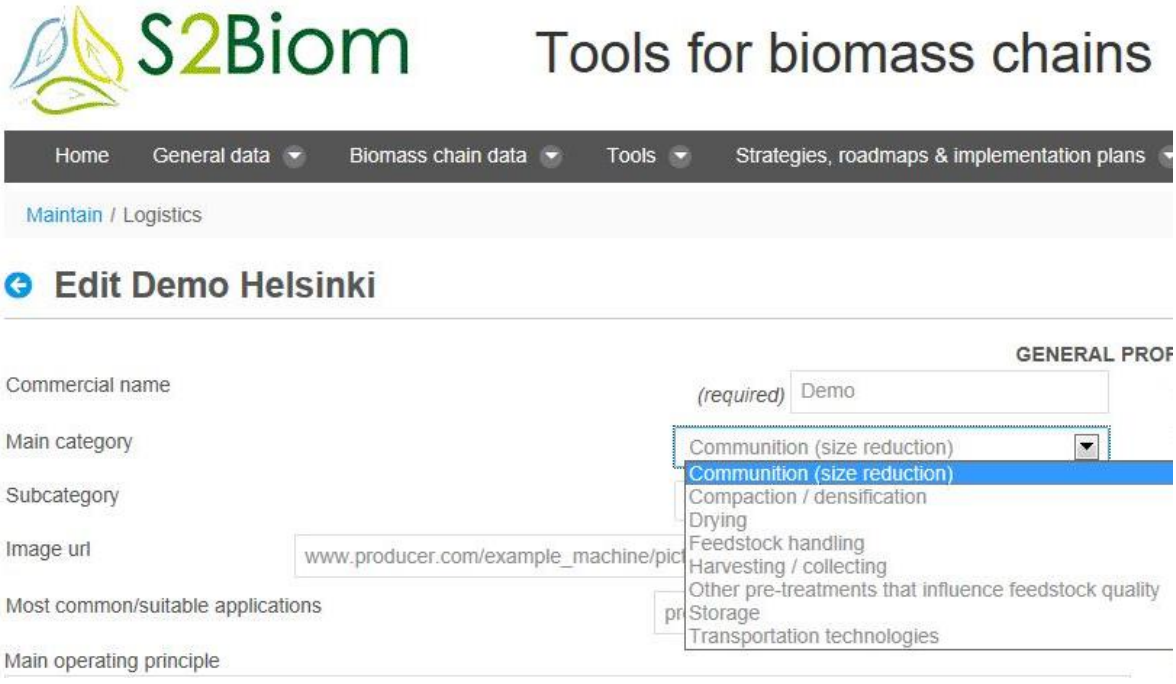
A detailed analysis is carried out on these biomass characteristics, and on how they can combine with each other. The results will be shown in a tool which optimises biomass resource utilisation. This tool will be of utmost usefulness especially for policy making, i.e. advising on what pre-treatment methods and conversion methods should be further developed to attain a higher biomass resource utilisation rate in the EU28.

c. Identification of optimal logistics for sustainable non-food biomass feedstock delivery chains

The efficiency at which biomass feedstock can be used for producing bioenergy and bio-based services is very important. In this respect, biomass feedstock poses a real challenge in terms of quality, handling and logistics that can be strongly influenced by a variety of independent factors (e.g. moisture content of biomass can restrict conversion options).

The first objective in this activity was to identify and characterise the main logistical components. A logistical component is defined as one of the links in the biomass value chain from biomass to (final) conversion. Examples are pre-treatment, storage and transport technologies that are needed to deliver biomass feedstock of a specified quality at the correct moment to a processing technology.

A comprehensive list of properties of logistical components was drawn up based on the knowledge and expertise of Project Partners. These properties were divided in the following groups: general, technical, biomass input specifications, biomass output specifications, financial and economic and other. A special section in the S2Biom tool for biomass chains gives access to the database on logistical components. The main categories are visible in the figure below.

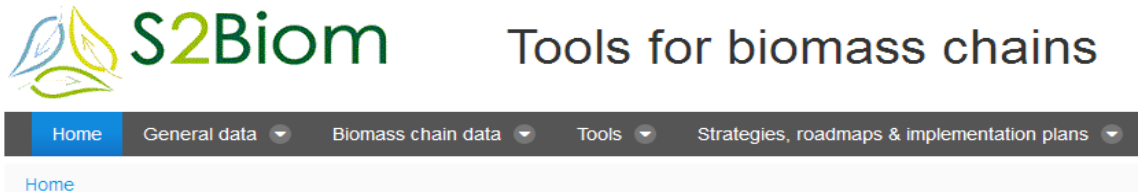


More than 200 logistical components have been included in the database. The vast majority of records can be found in the main category comminution (size reduction), followed by transportation and harvesting/collecting. The other main categories (feedstock handling, storage and compaction) will be populated gradually, the work on relevant databases being an ongoing process throughout the project lifetime and beyond.

d. Development of a toolset for interactive biomass supply – demand matching in sustainable biomass value chains

The toolset aims to provide an easy access to a systematic, spatially-specific, readily understandable and visually attractive overview of data on biomass cost-supply as well as conversion and pre-treatment technologies, and their matching. It also provides information about logistics, storage (biomass hubs and yards) and market demand, thus allowing optimal design of biomass delivery chains and networks at local, regional, national and European scale in EU28, Western Balkans, Ukraine, Turkey and Moldova at regional, national and European wide scale. The toolset also provides an overview of policies concerning biomass for bioenergy and bio-based products.

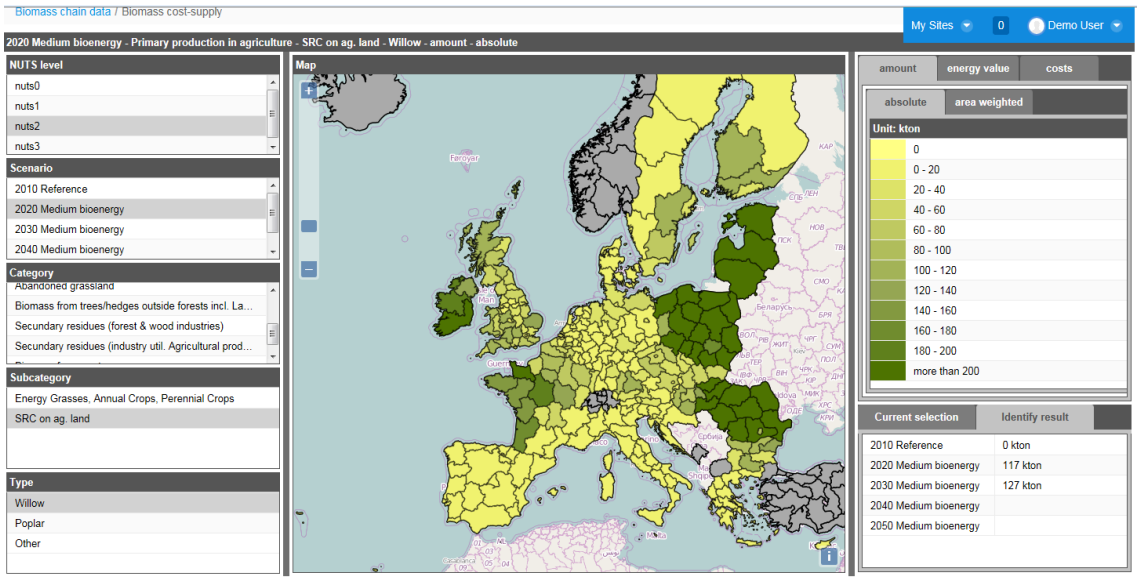
The tools developed in S2Biom are made available through a general user interface which can be accessed at www.biomass-tools.eu.



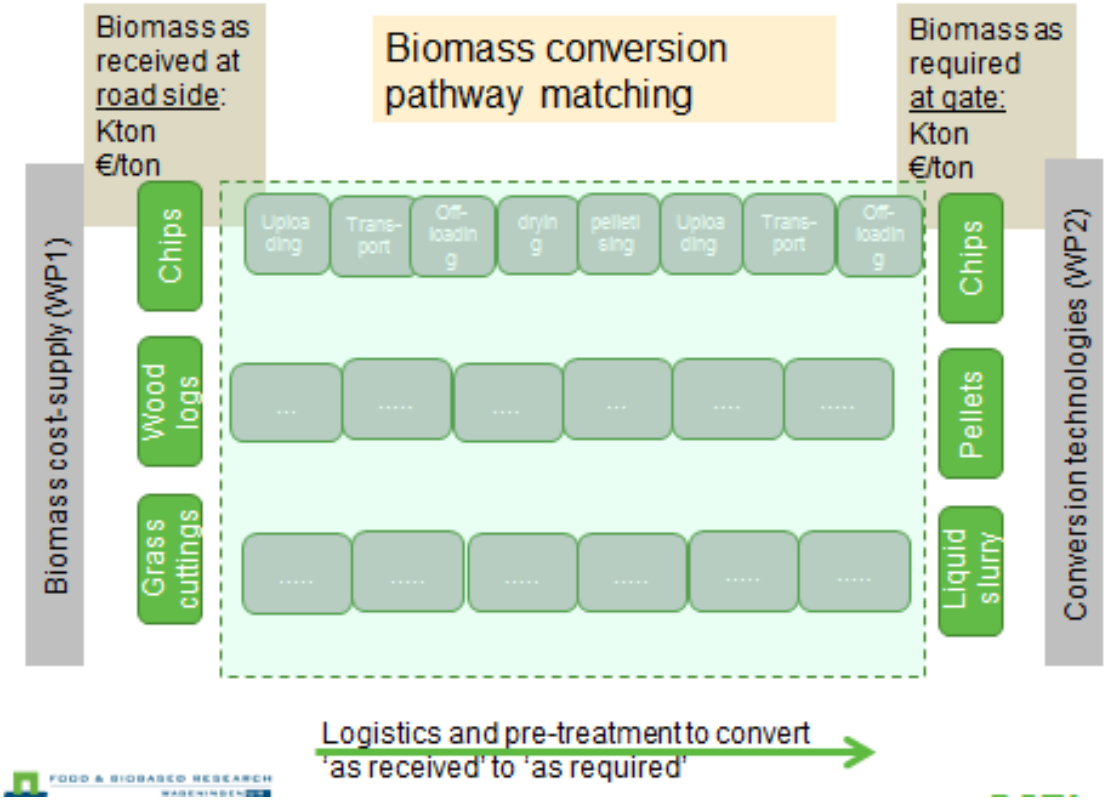
For the moment, the different sections and subsections include only an explanation on what will be included in the future. Only Project Partners have access to all currently available functions, which enables them to test them in support of the further development.

Several tools are being currently developed and will be made accessible to end-users in 2015.

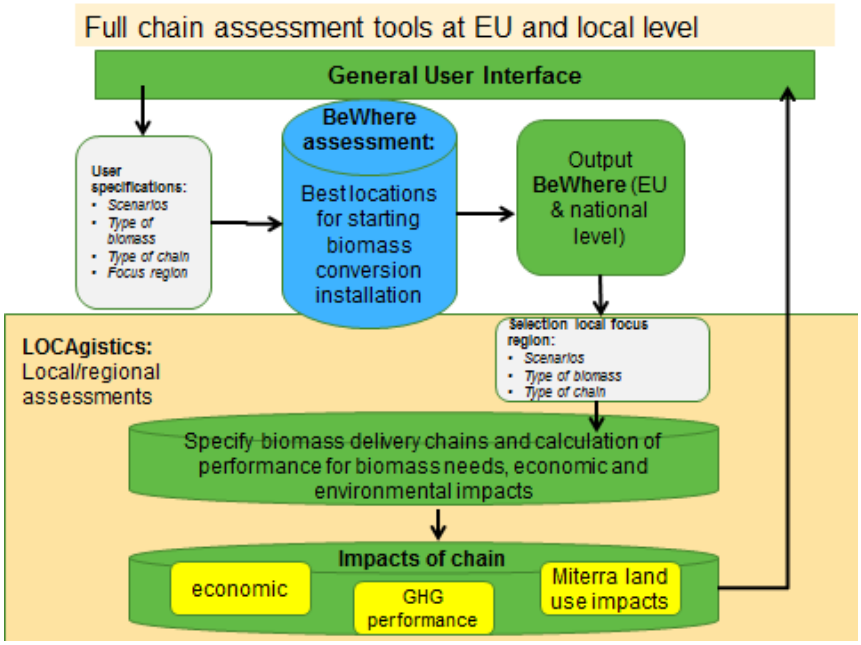
The **cost-supply viewing and download tool**, which enables users to obtain a spatially specific overview of data on cost-supply and of biomass potentials. The current version only provides access to the baseline potentials for ligno-cellulosic biomass in EU28 and several Western Balkans countries.



The **biomass-conversion technology matching tool**, which supports users in finding the best match between biomass types and conversion technologies, in terms of technical suitability and eventually economic and GHG efficient use. The tool integrates results on biomass potentials and composition, on types of conversion technologies and minimal biomass requirements and on pre-treatment technologies to densify, dry and adapt the composition of the biomass to make it suitable for a specific conversion.



The **full chain assessment tool BeWhere** is currently under development. This already existing tool is further developed in S2Biom and supports the development of European wide and national strategies to come to an optimal network of biomass delivery chains for reaching specific bioenergy demand targets. The basis of this tool is a techno-economic spatial model that enables the optimal design and allocation of biomass delivery conversion installations based on the minimisation of the cost and emissions of the full supply chain taking account economies of scale, in order to meet certain demand. For making this possible, it incorporated the input on biomass cost-supply, the conversion technology specifications, the logistical and pre-treatment technologies and the demand categories. It provides as output a network of existing and new biomass conversion and pre-treatment plants according to optimal selection of technology, their location and capacity, the costs of each segment of the supply chain and avoided emissions for different demand-supply solutions.

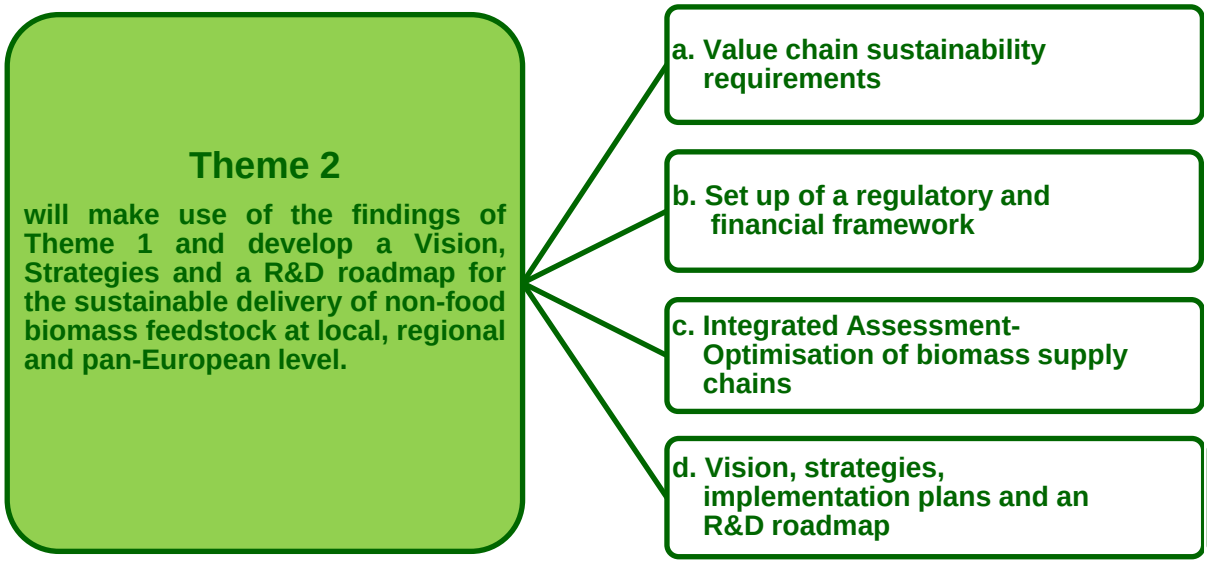


The outcome of **BeWhere** tool on allocation of new biomass conversion chains can be further assessed by the **LOCAgistics** tool that is currently developed for a selection of regions in Europe. This tool evaluates in a comparative way the spatial implications and the environmental and economic performance of the solutions suggested by the **BeWhere** tool for new biomass conversion pathways. It will take into account the biomass cost-supply, the conversion and pre-treatment technology options and the novel logistical concepts of biomass hubs and yards. It will provide a more detailed analysis of the feasibility for allocating new biomass delivery chains taking into account local availability of biomass and the economic and environmental consequences of the chain, including cost of operation, potential economic margins to be reached, emissions and carbon impacts including land based effects.

Finally there are several viewing tools under development which enables systematic access and data extraction. They include viewing and analysis tools on:

- The regulatory framework for bioenergy and bio-economy development in Europe. This tool should enable the extraction of information on main EU and national legislation and stimulation measures for bio-based activities
- The main existing and new thermos and bio-chemical technologies for biomass conversion into energy and a selection of building blocks for bio-based material production
- The main existing and new pre-treatment technologies for biomass drying, densification and composition alteration to improve its suitability for further conversion into energy and bio-based materials
- The sustainability risks and requirements of biomass use and conversion according to existing certification schemes, and current and future policy developments. This sustainability evaluation framework includes an overview of sustainability indicators which applies in the remaining time of the S2Biom project to assess the environmental and socio-economic performance of biomass delivery chains using different biomass resources, conversion, pre-treatment and transport technologies.

Theme 2 – Vision, Strategies and R&D Roadmap



a. Value chain sustainability requirements

The general objective of this activity is to provide an improved understanding among decision-makers in policy and industry as well as in the scientific community and civil society regarding sustainability requirements in the biomass value chains addressed in the methodological approaches. In order to achieve this, the following reports have been developed:

- Methodology for life-cycle based environmental sustainability assessment of non-food biomass value chains (JRC).
- Benchmark and gap analysis of criteria and indicators (C&I) for legislation, regulations and voluntary schemes at international level and in selected EU Member States (IINAS).
- Consistent cross-sectorial sustainability criteria and indicators (IINAS).

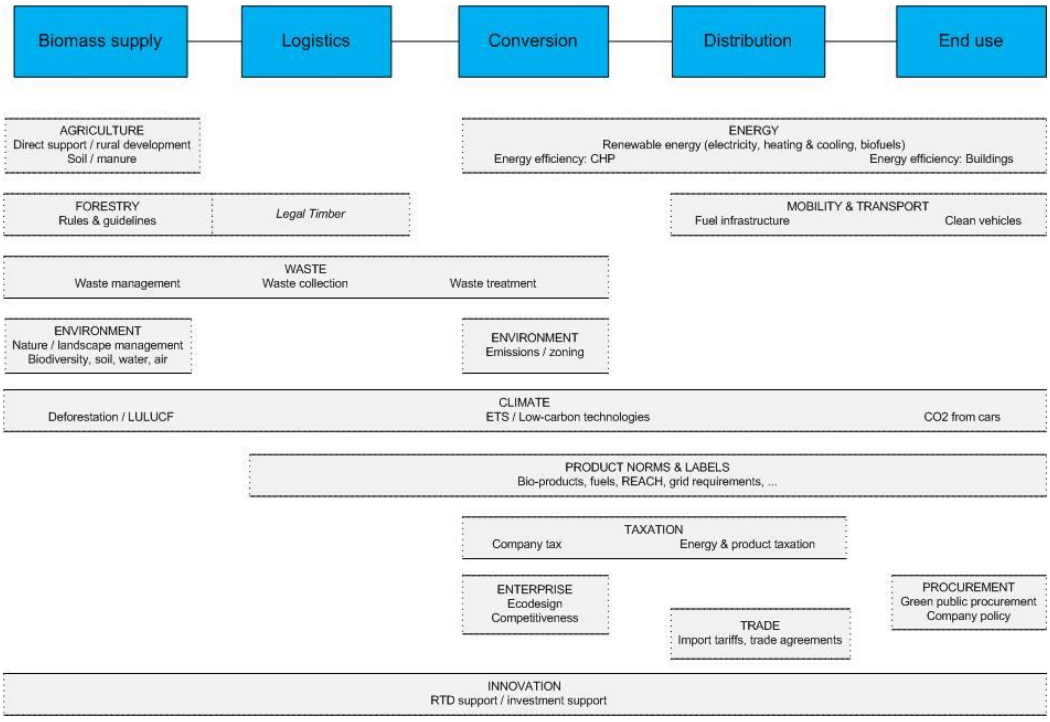
The reports are publically available on the project website www.s2biom.eu.

Moreover, in order to discuss on the sustainability issues of the S2Biom project a workshop entitled “Sustainability issues for the deployment of bioeconomy” was organised in the JRC premises in Ispra, Italy on 20 November 2014.

b. Set up of a regulatory and financial framework

The objectives of the regulatory and financial framework mobilising non-food biomass to bio-based products and bioenergy markets is to provide a structured overview of all elements of economic and regulatory frameworks that relate to the sustainable delivery of non-food biomass at different levels of governance across Europe (i.e. local, regional and pan-European) and to develop coherent policy guidelines (with a set of indicators) that will allow policy makers from the respective levels of policy determination to quickly appreciate the support frameworks that exist and the most efficient ways to apply them for the future use of biomass in a sustainable manner.

During the first half of the project duration, a **database for policy instruments and measures** have been created and **information on relevant regulations** in the S2Biom target countries has been collected. Regulations or instruments which have impact on any part of the (ligno-cellulosic) biomass value chain, i.e. from biomass production, logistics, conversion, distribution up to end use markets, have been included. The policy fields covered were agriculture, forestry, waste, environment, climate, energy, transport, taxation, trade, normation, procurement, enterprise/economy and innovation.



The types of instruments included were classified as:

- financial instruments, e.g. feed-in tariff, tax reduction, subsidies, loans, R&D funding, tradable certificates, …
- regulatory instruments, e.g. requirements, substitution obligation, permitting, zoning, procurement rules, binding standards, …
- soft measures e.g. strategies, action plans, product labels, voluntary standards, publicity campaigns, guidelines, platforms, …

An on-line working tool where instruments and measures can be looked up (factsheets) by general users has been developed. The tool has been aligned with other European initiatives BERST, BiomassPolicies and BioTrade2020+, i.e. all regulations collected in these projects will be entered in the same policy database. The tool is currently available at s2biom.vito.be, but will be integrated later in the S2Biom tool.

Currently, around 500 measures and instruments are included in the database. Some countries in South and North Europe still need to be further addressed. The information of the existing policy sheets is currently being assessed for consistency. Once this is done, it will be launched to the public.

The next step will be to benchmark country approaches for the mobilisation of sustainable non-food biomass. For specific cases/value chains, country approaches will be compared, with the key measures and instruments, the impact on market and industry development, and how the use of biomass balances between different sectors.

c. Integrated Assessment - Optimisation of biomass supply chains

This activity provides the overall analysis, addressing the question to what extent EU biomass potential will be sufficient to meet the renewable energy targets for 2020 and beyond, and in parallel provides a basis to start a bio-based chemistry sector.

Draft scenarios were developed and shared within the consortium. As key uncertainties and therefore scenario determining factors, the policy framework on sustainable biomass (and related uncertainty in biomass availability) and the nature of bio-based markets and industries (European/centralised vs local/decentralised) were identified. The scenario report has been published on the project website and will be adapted if the developments later in the project require so.

A review of bio-based products and markets is being prepared: some 13 product-market combinations have been identified and are currently under review. Results so far indicate that many bio-based chemistry markets are still under development, which means that several assumptions will need to be made to estimate long-term biomass demand for these pMCs. In order to validate these assumptions, interaction with relevant stakeholders is foreseen.

Concerning the integrated assessment of biomass-to-energy and biomass-to-chemistry routes, expansion and preparation of the analytical tool to be used, the **RESolve** model, is on-going. Given the characteristics of the market review outcome, stakeholder interaction is essential in order to assess the results. For example, the impact of the introduction of biomass-to-chemistry chains on marginal biomass costs will be assessed. One question to be asked to the bio-based industry will then be: “with the indicated marginal biomass costs, will you be in business?”

S2Biom is looking forward to interesting discussions on these issues

d. Vision, strategies, implementation plans and an R&D roadmap

This activity aims to exploit the techno-economic background information from S2Biom and translate the large datasets of sustainable ligno-cellulosic biomass value chains across Europe to targeted strategic documents and market-industry oriented implementation plans for the sustainable delivery of non-food biomass feedstock at pan-European level. The strategies and implementation plans will be further adjusted so that they can be used at the regional level. It is structured in three tasks.

The first task focuses on capacity mapping, gap analysis, trends and future scoping for the supply of ligno-cellulosic biomass in Europe. An overview report has been prepared which aims to understand the current state of biomass use for bioenergy, biofuels and bio-based materials and appreciate the factors influencing the security and future prospects of their supply. The report will be updated to include the gaps in policy and strategies which require attention and appropriate planning at the various levels of governance (EU, Energy Community, national, local).

Based on the overview and the identified gaps, the second task aims to establish a vision statement for an expanded role of sustainable non-food biomass supply and delivery in the European bio-based economy. The first version of the Vision will be presented in a call for evidence consultation on the project website in September 2015.

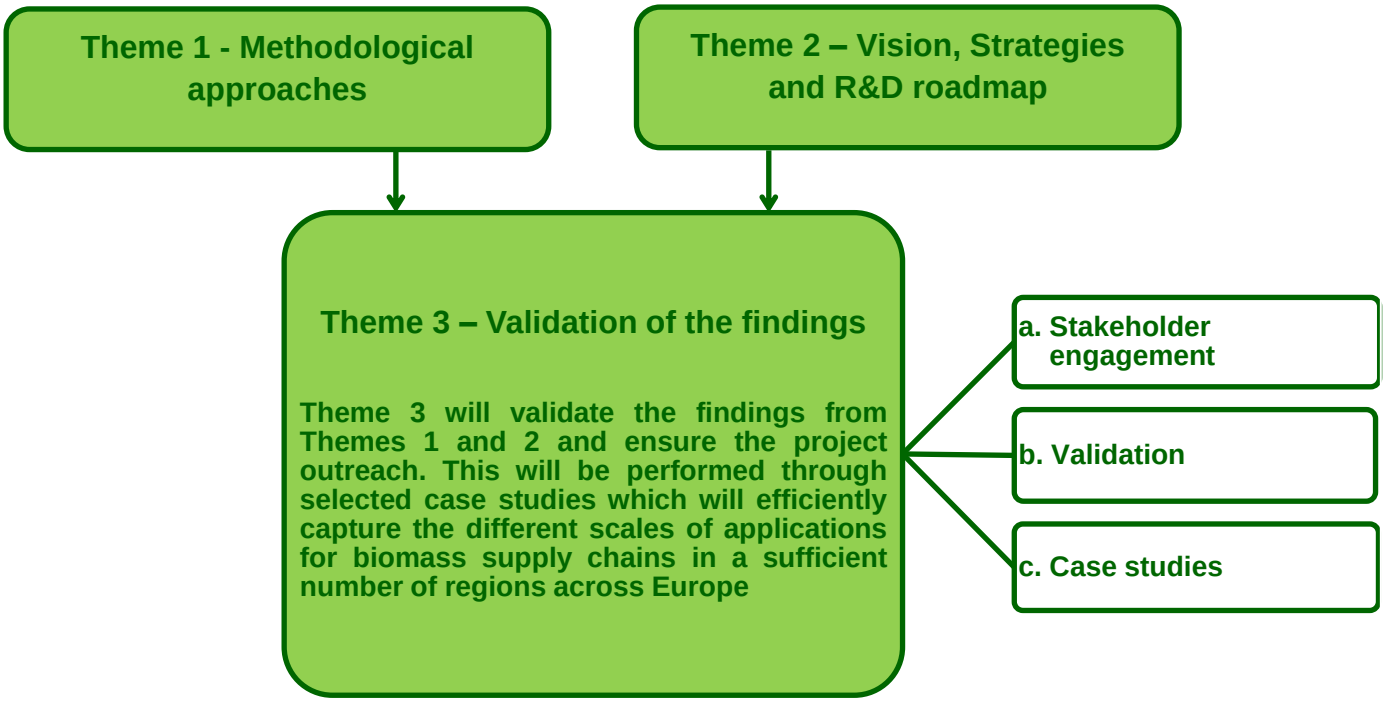
The aim of the third task is to develop strategies and implementation plans for achieving the vision statement including the goals, identifying policy and regulatory priorities in the short, medium and longer term as well as appropriate implementation plans at pan-European and regional level. These will be tailored to different levels of governance (local, national & regional) and to industrial sectors.

Theme 3 – Validation of the findings

The validation of the findings from Themes 1 and 2 will be implemented within this theme as well as the project outreach throughout its duration. Theme 3 focuses on two complementary sets of activities, both strongly oriented towards external stakeholders.

On the one hand, Theme 3 groups actions related to the validation of the findings of Theme 1 and Theme 2, particularly of the toolset and of strategies and roadmaps. This is mostly done through the implementation of a wide-ranging series of **case studies** that, allowing for different levels of detail, contribute to further strengthening the project's knowledge base (data collection) and to testing the tools in terms of accuracy, reliability and completeness.

On the other hand, Theme 3 incorporates the broad set of activities related to communication and project outreach, including the engagement of stakeholders along the sustainable biomass value chain (from production to conversion) in EU Member States, current and potential Candidate Countries and some of those encompassed by the Eastern Partnership. Since the beginning of the project, an information campaign for the wide dissemination of project activities and results is being implemented and can be viewed at www.s2biom.eu.



a. Stakeholder engagement

The S2Biom consortium is committed to developing an inclusive relationship with the multifaceted audience of stakeholders participating in the sustainable biomass value chain and debate, with extensive consultations implying openness to bottom-up input.

Stakeholders have been identified in close collaboration with all Project Partners, and an extensive stakeholder database has been established and is constantly updated.

Initially, the Consortium envisaged to set-up 5 sector-specific working groups that were expected to contribute with their expertise to fine-tuning the scope of activities and to validating intermediate project findings and results.

A **Stakeholder engagement plan** has been formulated with different techniques to identify stakeholder requirements, structuring stakeholder engagement and ways to implement feedback.

However, owing to unforeseeable limitations deriving from the frequent unavailability of a sufficient number of qualified working groups members, the Consortium opted for a “variable geometry” approach: stakeholders have been grouped in a single cross-sector expert group that is informed of project progress and findings, and is approached by the Consortium flexibly, according to specific needs, sometimes even with individual meetings. Stakeholders’ inputs, suggestions and recommendations are integrated in the project methodology and results.

Stakeholders are also expected to play an important role in the validation of the toolset and of strategies and roadmaps, while being an important interlocutor during the implementation of case studies.

b. Validation

Validation and testing within S2Biom describes the process of assessing and adapting the results in three separate steps:

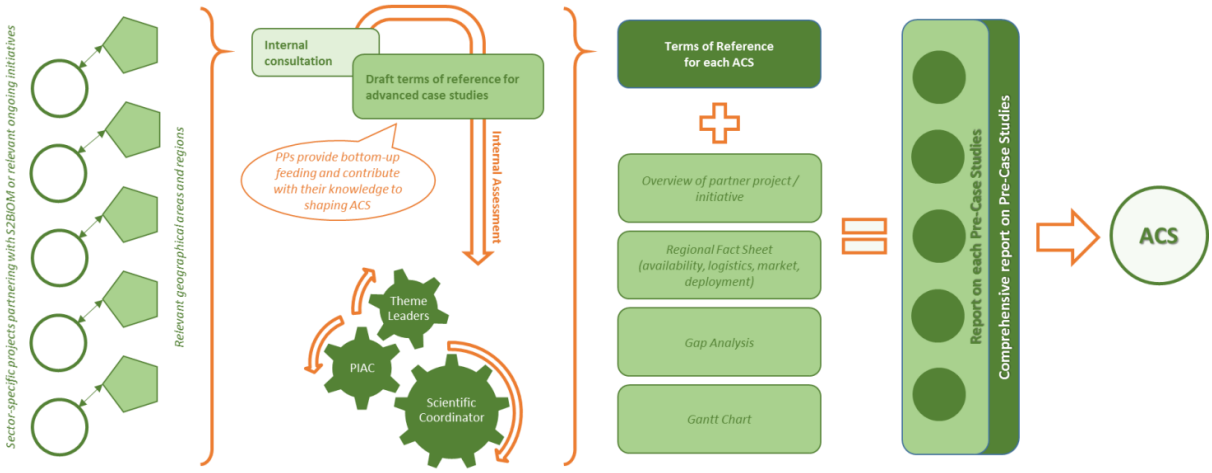
- identification of stakeholder requirements and implementing them,
- testing the toolset together with the stakeholders and changing it accordingly,
- applying the findings in case studies.

A first workshop for evaluation and testing is organised during the **European Sustainable Energy Week in Brussels on 16 June 2015**. The workshop, which gathers stakeholders from the whole biomass supply chain, has the following objectives:

- testing and validating the toolsets for interactive biomass supply together with the stakeholders,
- providing detailed information about the project, its objectives and its methodology,
- raising awareness of the opportunities from project activities and results,
- mobilising commitment from participants to support project activities.

c. Case Studies

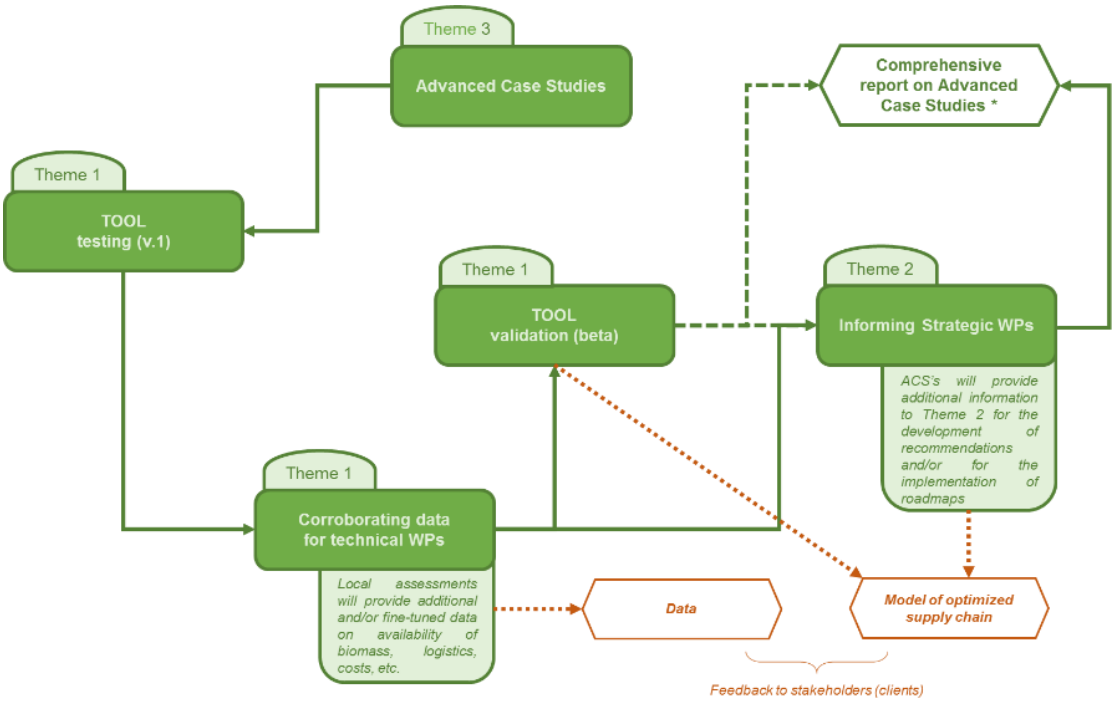
In order to expand and further detail relevant datasets collected in Theme 1, to complement the strategies and roadmaps developed in Theme 2 with the conditions of concrete regions in a bottom-up fashion, and, ultimately, test and validate the Toolset through a top-down application to specific contexts in a close-to-real-life environment, the Consortium foresaw a multi-layered set of case studies to be implemented in at least ten regions across EU28 and Neighbouring countries. The case study exercise is devised in two-plus-one complementary components in a way to better reflect the specificities of different areas involved, as well as the characteristics of the value chains examined.



In areas with more developed and structured sustainable biomass-to-energy value chains, the Consortium is implementing Pre-studies for the acquisition of extra data in selected regions. Pre-studies are being carried out or planned in the following regions:

- *Tri-National region Upper Rhine Region*
- *Netherlands*
- *France Region (Burgundy)*
- *Spain 1 Region (Miajadas)*
- *Spain 2 Region (Zaragoza, Aragon region)*
- *Scandinavian Region (Eastern Finland)*

These will further inform **Advanced Case Studies (ACS)**, for the appraisal of regional strategies and local action plans, and the testing/validation of the Toolset. ACS will also provide the baseline for the elaboration of local policy recommendations and implementation plans for industrial deployment of biomass.



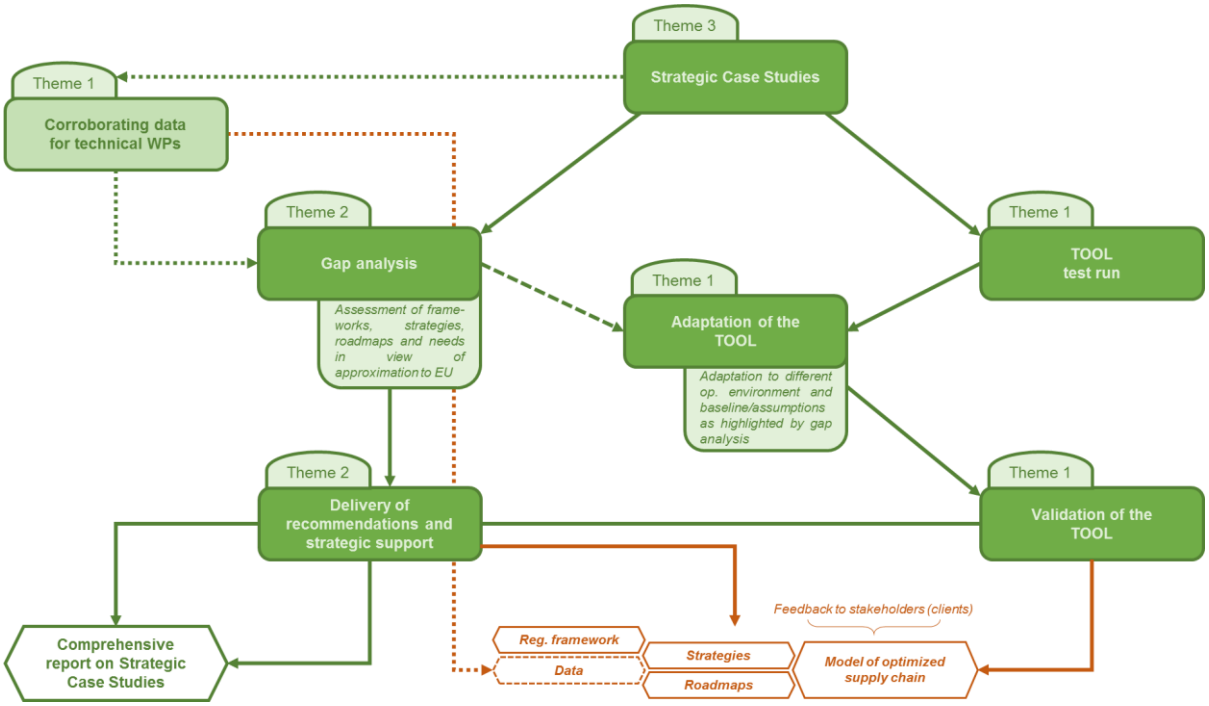
One ACS is already under implementation, and will soon be followed by other regions.

Scandinavian Region: Äänekoski region, Finland

Äänekoski biorefinery

- Investment: €1.100 million
- Time schedule:
  2015: planning and selection of equipment;
  2016: installation of main equipment;
  2017: starting new factory;
  2018: commercial operation.
- Feedstock: 6,5 mln. m³/year or 18.500 m³/day of wood, i.e. 240 trucks & 70 railway cars a day
- Bio-products: pulp, turpine, tall oil, lignin products, activated sludge, biogas and fertilizers, sodium sulphate (Glauber´s salt), new fibre products
- Pulp production: 1.3 mln. t/year or 3.700 t/day, i.e. 45 railway cars (87,5% for export)
- Production of black liquor for combustion is 80 litres/s
- Factory produces 1.800 GWh electricity (2.5 % of Finnish electricity production) and production is 2.4-times higher than consumption, annual sales of electricity is 1.050 GWh
- Process heat production and district heat 7 000 GWh of which sales will be 640 GWh/a
- Wood energy 1.200 GWh of which 800 GWh/a will be sold

While Advanced Case Studies will mainly be implemented in EU28 building on synergies with other projects and ongoing initiatives, **Strategic Case Studies (SCS)** will be performed in areas with lower biomass supply and logistics development, and relatively poor availability of data.



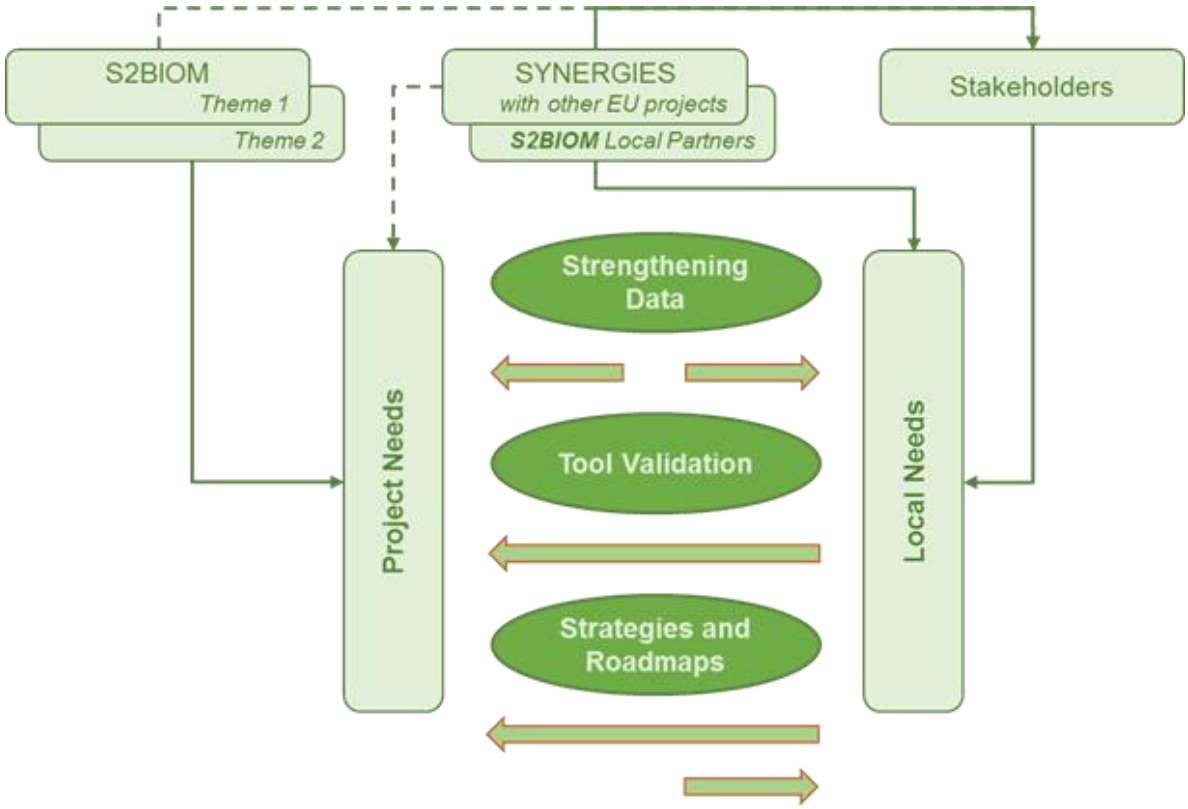
SCS address wider, more strategic aspects, focusing also on the involvement of respective stakeholder groups. SCS are being carried out or planned in the following regions:

- ***Danube Region (Autonomous Province of Vojvodina, Serbia)***
  The case study, implemented by the Faculty of Technical Sciences of the University of Novi Sad, has been designed in such a way to provide in-depth insight in the current situation and potentials of ligno-cellulosic biomass in the Autonomous Province of Vojvodina (Serbia), including an assessment of supply chains and logistics, that will lead to articulating a preliminary assessment of the feasibility of a bio-ethanol plant in the region.

- ***South-East Europe and Turkey (Greece, Serbia, Turkey, Romania, Bulgaria)***
  The case study, implemented by CERTH, focuses on the possibilities of implementing agrobiomass co-firing in existing and upcoming lignite-fired plants. It includes a regional overview of potentials, indicative costs for delivery to the power plants for different supply chains, cost comparisons with alternative bioenergy options. Finally, based on the outcomes of the case study, suitable support schemes for agrobiomass co-firing in lignite power plants will be developed.

- ***Eastern Europe (Ukraine)***
  The case study, implemented by the Renewable Energy Agency of Ukraine, will provide an assessment of most promising residues at country level, including primary and secondary agricultural residues, residues from the agro-food complex, woody biomass, and energy crops. The case study will assess existing barriers to the access of non-food biomass feedstock to the energy market, and suggest technical and legal measures to foster effective mobilization and delivery at the local and national level.

Looking into areas with technologically less advanced biomass utilisation, weaker supply chains, inadequate infrastructures, and relatively poor availability of data, S2Biom is complementing its datasets and highlighting bottlenecks in the development of biomass value chains. This allows addressing a series of **strategic aspects and key players**, including the applicability of strategies and roadmaps, and of the Toolset.



The project also supports alignment with international development policies, promotes interaction of local initiatives with existing cooperation programmes and supports shaping activities in view of future financing opportunities.

Project Coordination

FNR - Agency for Renewable Resources, Germany
Project Coordinator

Contact: Ludger Wenzelides
Email: l.wenzelides@fnr.de
Phone: +49 3843 6930 177
Website: www.fnr.de

IC - Imperial College London, United Kingdom
Scientific Coordinator

Centre for Energy Policy and Technology
Contact: Calliope Panoutsou
Email: c.panoutsou@imperial.ac.uk
Phone: +44 20 7594 6781
Website: www3.imperial.ac.uk

Department of Chemical Engineering
Laboratory of Process Systems Engineering
Contact: Prof Nilay Shah
Email: n.shah@imperial.ac.uk
Phone: +44 20 7594 6621
Website:www3.imperial.ac.uk

Project Partners

DLO - Alterra Stichting Dienst Landbouwkundig Onderzoek, The Netherlands

Contact: Berien Elbersen
Email: berien.elbersen@wur.nl
Phone: +31 317 481935
Website: http://www.wageningenur.nl/en.htm

Contact: Bert Annevelink
Email: bert.annevelink@wur.nl
Phone: +31 317 488700
Website: http://www.wageningenur.nl/en/fbr

ALU-FR - University of Freiburg, Germany

Contact: Matthias Dees
Email: matthias.dees@felis.uni-freiburg.de
Phone: +49 761 203 3697
Website: www.uni-freiburg.de

JR - Joanneum Research, Austria

Contact: Mathias Schardt
Email: mathias.schardt@joanneum.at
Phone: +43 316 876 1754
Website: www.joanneum.at

IIASA - International Institute for Applied Systems Analysis, Austria

Contact: Nicklas Forsell
Email: forcell@iiasa.ac.at
Phone: +43 2236 807 334
Website: www.iiasa.ac.at

EFI - European Forest Institute, Finland

Contact: Marcus Lindner
Email: marcus.lindner@efi.int
Phone: +35 8 50 3564174
Website: www.efi.int

METLA - Finnish Forest Research Institute, Finland

Contact: Perttu Anttila
Email: perttu.anttila@metla.fi
Phone: +359 50 391 3088
Website: www.metla.fi

VTT - Technical Research Centre of Finland, Finland

Contact: Matti Virkkunen
Email: matti.virkkunen@vtt.fi
Phone: +35 8 40 5451743
Website: www.vtt.fi

UniBO - University of Bologna, Italy

Contact: Andrea Monti
Email: a.monti@unibo.it
Website: www.unibo.it

ECN - Energy research Centre of the Netherlands, The Netherlands

Contact: Marc Londo
Email: Londo@ecn.nl
Phone: +31 88 515 8253
Website: www.ecn.nl

VITO - Flemish Institute for Technological Research, Belgium

Contact: Luc Pelkmans
Email: luc.pelkmans@vito.be
Phone: +31 88 515 8253
Website: www.vito.be

IINAS - International Institute for Sustainability Analysis and Strategy, Germany

Contact: Uwe R. Fritsche
Email: uf@iinas.org
Phone: +49 6151 9432 40
Website: www.iinas.org

CC - Clever Consult, Belgium

Contact: Dirk Carrez
Email: d.carrez@cleverconsult.be
Phone: +32 2 270 55 34
Website:www.cleverconsult.eu

SYNCOM - Research and Development Consulting GmbH, Germany

Contact: Klaus Lenz
Email: k.lenz@syn-com.com
Phone: +49 4222 9479880
Website: www.en.syn-com.com

WIP - Renewable Energies, Germany

Contact: Rainer Janssen, Cosette Khawaja
Email: rainer.janssen@wip-munich.de
cosette.khawaja@wip-munich.de
Phone: +49 89 720 12 743
Website: www.wip-munich.de

BTG - Biomass technology group BV, The Netherlands

Contact: Douwe van den Berg
Email: vandenberg@btgworld.com
Phone: +31 53 4861189
Website: www.btgworld.com

CEI - Central European Initiative, Italy

Contact: Peter Canciani
Email: canciani@cei.int
Website: www.cei.int

IUNG - Institute of Soil Science and Plant Cultivation, State Research Institute, Poland

Contact: Magdalena Borzecka-Walker
Email: mwalker@iung.pulawy.pl
Phone: +48 818863421
Website: www.iung.pulawy.pl

SDEWES - The International Centre for Sustainable Development of Energy, Water and Environment Systems, Croatia

Contact: Neven Duić
Email: neven.duic@fsb.hr
Phone: 385 1 6168 126
Website: www.sdewes.org

EU-SEI - Ege University Solar Energy Institute, Turkey

Contact: Günnur Kocar
Email: gkocer@gmail.com
Phone: +902323111234
Website: www.egeweb.ege.edu.tr/eusolar

INRA - National Institute for Agricultural Research, France

Contact: Benoit Gabrielle
Email: Benoit.Gabrielle@agroparistech.fr
Phone: +33 1 30 81 55 51
Website: www.inra.fr

JRC - Joint Research Centre - Institute for Environment and Sustainability, Italy

Contact: Boyan Kavalov
Email: Boyan.Kavalov@ec.europa.eu
Phone: +39 0332 78 56 79
Website: www.ies.jrc.ec.europa.eu

CENER - CIEMAT Foundation, Spain

Contact: David Sanchez Gonzalez
Email: dsanchez@cener.com
Phone: +34 948 25 28 00
Website: www.cener.com

CIRCE - Research Centre for Energy Resources and Consumption, Spain

Contact: Daniel Garcia
Email: daniel.garcia@fcirce.es
Phone: +34 876 55 55 11
Website: www.fcirce.es

SFI - Slovenian Forestry Institute, Slovenia

Contact: Nike Krajnc
Email: nike.krajnc@gozdis.si
Phone: +38641412391
Website: en.gozdis.si

CERTH - Centre for Research & Technology Hellas, Greece

Contact: Panagiotis Grammelis
Email: grammelis@certh.gr
Phone: +30 211 1069504
Website: www.certh.gr

REA - Renewable Energy Agency, Ukraine

Contact: Tetiana Zheliezna
Email: zhelyezna@biomass.kiev.ua
Phone: +380 44 223 55 86
Website: www.rea.org.ua

UB-FME - University of Belgrade - Faculty of Mechanical Engineering, Serbia

Contact: Dragoslava Stojiljkovic
Email: dstojiljkovic@mas.bg.ac.rs
Phone: +381113370299
Website: www.bg.ac.rs

Census-Bio, United Kingdom

Contact: Melvyn Askew
Email: melvyn.askew@btinternet.com
Phone: +441902744447

Biomass Research, The Netherlands

Contact: Hans Langenveld
Email: hans@biomassresearch.eu
Website: www.biomassresearch.eu

This brochure has been developed by WIP-Renewable Energies as part of the S2Biom Project.

S2Biom has received funding from the European Union's 7th Framework Programme for research, technological development and demonstration under grant agreement No FP7-608622.

March 2015