European Commission

Bioeconomy Investment Summit

Unlocking EU leadership in 21st Century Bioeconomy

Final report of the conference held in Brussels, 9-10 November 2015

Research and Innovation

EUROPEAN COMMISSION

Directorate-General for Research and Innovation
Directorate F - Bioeconomy
Unit F.1 — Strategy

Contact: rtd-bioeconomy-summit-2015@*ec.europa.eu*
or

RTD-PUBLICATIONS@ec.europa.eu

European Commission
B-1049 Brussels

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Written by Rory Watson

Directorate-General for Research and Innovation

2015

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Luxembourg: Publications Office of the European Union, 2015.

PDF	ISBN	doi:	Catalogue number
	978-92-79-57655-3	10.2777/424667	KI-04-16-293-EN-N

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INTRODUCTION

Transforming the bioeconomy from "a niche to the norm" is the challenge the EU now faces Carlos Moedas, the European Commissioner for Research, Science and Innovation said in his opening address. Sharing the platform, his fellow Commissioner, Phil Hogan, with responsibility for agriculture and rural development, paid tribute to the efforts millions of people in farming, forestry and rural communities across Europe are making to rise to this challenge and help place the bioeconomy at the heart of the EU's investment agenda.

Over the two days, the 400+ participants from many different sectors, professional backgrounds and nationalities brought their own perspectives on how to unlock public and private funding. It provided a platform to examine innovative commercial and competitive uses for natural resources leading to the creation of entirely new, environmentally sustainable markets. The conference also showcased successful forestry, agriculture, aquaculture and bio-based products business examples, while over 20 EU-funded research projects demonstrated how the bioeconomy is transforming traditional production patterns.

This report provides a record of the conference. It contains two annexes. The first is an executive summary of the salient issues raised. The second provides brief details of the various success stories presented during the two days.

WELCOME AND SETTING THE SCENE

9 November 09:15-09:45 am

Carlos Moedas, Commissioner for Research, Science and Innovation opened the proceedings. "We're here today to learn from each other. We're here to discuss how investment can bring speed and scale to the European bioeconomy," he told participants. The bioeconomy has huge potential to create employment, especially in rural and coastal areas; to diversify Europe's energy resources with low carbon alternatives to fossil fuels; and to increase industry-driven GDP by contributing to a circular, resource efficient economy, he pointed out.

"When I talk about the European bioeconomy, I'm talking about using our renewables, biological resources to produce food, materials and energy. I'm talking about business models with resource-efficiency and environmental sustainability at their core. I'm talking about investing in new industries and creating new jobs," he explained.

He made clear the challenge facing the EU. "We need the bioeconomy to go from being a niche to the norm," he said. EU policy and financial support can help this transformation, but additional private investment is also necessary.

With his engineering background, Mr Moedas explained he sees the bioeconomy in terms of stocks and flows. "The stock is the overall volume of biomass available from forests, to crops and seas. The flows are their many uses in food, feed, energy and materials." Innovation can be used to increase available stocks by increasing yields, developing entirely new products and using waste as a resource.

This is part of a broader picture. "Generating value from all these discarded flows will make the bioeconomy the green engine of a wider circular economy. A circular economy in which all stocks have value at every stage of their life cycle."

The Commissioner emphasised how the new European Fund for Strategic Investment (EFSI) is already having an impact, providing new financing opportunities to bioeconomy projects with high risk profiles.

He made clear his vision for the bioeconomy: one that finds new commercial and competitive uses for natural resources; develops innovative, resource-efficient industrial processes; and leads to creation of entirely, new environmentally sustainable materials. To achieve that, the Commission is working to ensure coherence in EU policy across the board with the circular economy package being a natural first step

Phil Hogan, Commissioner for Agriculture and Rural Development, told participants the conference would show "how the bioeconomy will help to shape the economy of the future". With his current responsibilities, he expressed his pleasure that farmers, forests and rural areas can make a real contribution towards developing the bioeconomy.

He emphasised the importance of the agri-food and forestry sectors to Europe's economy and society. Agriculture is the EU's biggest employer, involving 25 million people, managing 46% of EU territory and, with the food sector, produces a value added of €420 billion a year. Forest-based industries provide nearly 3.5 million jobs and a total added value of €135 billion annually.

The increase in demand from new markets for agricultural raw materials for the non-food sector is creating jobs and income opportunities for agricultural holdings, smallholders, forest owners and related sectors. These developments are leading to new bio-based products, such as biolubricants and bioplastics and ecosystem services like soil carbon sequestration. "There will be many further opportunities for farmers and forest owners to open up new revenue streams in these areas," he said.

The Commissioner reminded the audience of the five recommendations the EU's Standing Committee on Agricultural Research (SCAR) had made a month earlier to underpin a sustainable bioeconomy: food first, sustainable yields, resource-efficient production and use, circularity and diversity of production systems in the primary sector. "These new value chains will be a pillar of the circular economy," he forecast. In that value chain, it is important to build trust and fair cooperation, in particular between farmers, forest holders and industry.

He pointed out that the EU supports the development of the bioeconomy in three main ways: research and funding, the European Agricultural Fund for Rural Development and its various activities and the EU forestry strategy. The Commission is working on a long-term strategy for European agriculture research and innovation. This will culminate in a major conference in Brussels on 26-28 January 2016. Currently, these activities are being largely supported through the EU's rural development policy and its Horizon 2020 programme.

In particular, the European innovation partnership on agricultural productivity and sustainability (EIP-AGRI) is bringing different partners together to work on common innovative schemes. It is expected to support almost 3,000 projects involving farmers, advisors, research and industry in testing ideas for traditional and new bioeconomy market opportunities.

"But we have to be absolutely crystal clear: greater ambition calls for greater investment. This is why the EU decided to nearly double its budget allocation to reach €3.6 billion for agricultural research under our flagship Horizon 2020 programme," the Commissioner said, as he gave details of the many individual financing schemes underway.

He concluded by saying: "Working together in forums such as this one today, we can pave the path to a more sustainable, more efficient and more prosperous future."

INVESTING IN THE BIOECONOMY

9 November 09:45-10:45 am

The panellists were asked how they would unlock investment in the bioeconomy, given the current low levels in the EU.

Jonathan Taylor, Vice-President of the European Investment Bank (EIB) Management Committee responsible for Environment and Climate Action, said consumers – intermediaries/businesses/wholesalers – need competitive pricing. Industry must make sufficient progress to be able to offer this. Innovators involved in the business need investment and markets, while investors require returns that reflect the risk. As a public bank, the EIB could find ways to de-risk that investment – the EFSI being one possibility – so private sector investors can have more confidence.

He emphasised the importance of predictability of regulation. Investors need reassurance over the lifetime of their investment that changes will not take place that would skew the pricing on which they had made their investment decision.

Mari Kiviniemi, Vice-Deputy Secretary-General of the OECD, agreed. She said that unlocking investment is key and requires long-term stability in the policy framework, especially after 2020 when Europe's renewable energy directive comes to a close. European leadership for the bioeconomy must remain after that date – not just for biofuels and energy, but also for chemicals and other bio-based products.

She emphasised the need for public support. She acknowledged that earlier fears on direct land use were receding, but the EU should take the lead in developing sustainable standards for the

bioeconomy, both in Europe and internationally. Finally, better coordination between industrial sectors is necessary to ensure coherence between all areas of the bioeconomy.

Later, Ms Kiviniemi confirmed that the OECD is discussing with the EU the creation of a platform where biomass user and producer countries could discuss their different views on sustainability issues when these arise.

Catia Bastioli, CEO of Novamont, President of Terna, noted that the bioeconomy is not simply about biomass. She stressed the importance of territorial regeneration and pointed to sustainable regions as key areas in which to invest. "The value of local areas in Europe is a very important heritage that we have to consider, a lot of biodiversity and a lot of cultural differences which we can leverage," she said. Examples that exist already on the ground show how this can be used to create markets for the bioeconomy to transform weak localities into growth areas.

Locally, there can be interconnection between businesses, farmers, universities and trade unions. With one innovative project per region, that interconnection could be extended to different regional projects. These should draw strength from Europe's distinctive regional biodiversity and not copy the large scale models of North and South America. That would help to create a common culture and scale up more effectively and faster. She emphasised the need to multiply ideas in local areas since "we don't today have one technology which is winning". That richness can be harnessed to connect different ideas to different local areas.

Later, she underlined the importance of having clear targets for EU policy. "Are we looking at smart houses or transport or how to cut CO^2? Then it is easier to invest. If we don't have these clear objectives, then it is more difficult," she said, adding that the EFSI helps since it creates an important de-risking factor that could be used more widely.

Denis Lucquin, Sofinnova Partners, maintained that it would not be possible to achieve the speed and scale Commissioner Moedas sought without agility. With 25 years' experience of investing in the healthcare industry in Europe and the US, he told the audience: "If you want to do things differently than we have up till now, you have to turn towards start-ups. They are the only way to provide agility and innovation in order sometimes to help big industrial groups work towards innovative products." At a recent conference in San Francisco some 40% of participants confirmed they were involved in start-ups, when asked. In Brussels, the same question raised very few hands.

Emphasising the need for agility and importance of scaling-up, he shared a personal experience. When he and his partners were looking to invest in technology for the chemical industry, they considered some 20 locations around the world. After 18 months of inconclusive detailed discussions with the EIB on whether this would involve a demonstration or commercial plant, they went to Canada and secured some 40% of the necessary financing within three to four months. "That is what I mean by agility. Don't be locked into categories of investment," he advised.

Later Mr Taylor acknowledged that agility is an issue, but the EIB has rigorous due diligence procedures for good reason. "It does help to provide external validation of the genuine economic value added which is being produced by the businesses we are investing in."

Mr Lucquin told the audience to forget bio-energy and to aim instead for renewable chemistry. The US had concentrated on the former for a decade and "it had been a mistake". The chemical industry, which will have to reinvent itself over the next 20 years "is a much more interesting target".

Jyrki Ovaska, Executive Vice President for Technology, UPM, noted that his company works with start-ups in many different fields, but suggested: "We should also find a start-up company within ourselves and have the same mentality in large organisations and companies." He pointed to the huge amount of willingness to make the bioeconomy happen in Europe. But its success will also depend on the quality of scalability of good business cases, he cautioned. "Only if we are successful in those single projects, make them commercial and scale them up, can we expect something relevant for the EU or the companies will happen," he said.

Asked what barriers exist, he cited policy unpredictability. "The only thing you know when you start something is that it will cost a lot of money and take a long time." For a project taking five to ten years, predictability is crucial and the EU, he said, did not have a good record in this area.

Replying to the same question, Ms Bastioli pointed to insufficient coherence between regional, national and European policies. She spoke of the need for a change in society's mind-set, criticising misleading information and 'greenwashing'. While some bio-based products may be more

expensive than traditionally manufactured ones, external costs must be factored in, such as cleaning sites once they fall into disuse.

In the discussion that followed, the audience asked what should be the expected payback time from an investment, whether scientific advice should be given to investors and why Europe is not Silicon Valley.

Mr Taylor replied that the EIB sometimes lends for 40 years. Private investors do not have that capacity which is why his organisation can help to bridge the gap between the need for long-term investment and investors' shorter term focus. For Mr Ovaska, the acid test is to pass the investment hurdle.

Both Ms Kiviniemi and Mr Ovaska agreed that while Europe is investing a lot of money in basic research, it should inject more into applied research, as do the US and China. "That is one of the reasons Europe is not the Silicon Valley," Mr Ovaska said, urging the EU to help projects towards their commercialisation. He considered the BBI joint undertaking to be an excellent start in that direction. Ms Kiviniemi argued for changes in EU bankruptcy legislation to allow people who fail in business to have a second chance, unlike at present. Mr Lucquin suggested that some sustainable regions could become their own mini Silicon Valleys in Europe, just as healthcare clusters had done around Cambridge, South of Paris and in Sweden. The bioeconomy could learn from that experience.

When it came to scientific advice to investors, Mr Ovaska considered serious thought should be given to how best to use the scientific and academic knowledge the EU has. To do that requires a driver, whether a start-up, an SME or a large company to coordinate and orchestrate the project. Mr Taylor emphasised that the demand has to come from the scientific and academic community. "If they come forward with good ideas, there are plenty of people out there who want to invest in them."

Each panellist was asked to identify one EU policy to encourage investment into the bioeconomy.

Mr Ovaska: provide risk mitigation because there are plenty of risks when you enter new areas and that is what biotechnology is.

Mr Lucquin: do not finance start-ups, try to finance the upper level. Scaling up is absolutely essential. That is where public money could make an impact.

Ms Bastioli: take regions with problems, make them more advanced and sustainable with opportunities to create new forms of cooperation concentrated on working together, creating new jobs and boosting growth.

Ms Kiviniemi: prepare new EU legislation focusing on bio-based materials, since new products such as chemicals, pharmaceuticals and plastics had been relatively ignored in recent years.

Mr Taylor: make the policy perspective as predictable as possible. "We really do shoot ourselves in the foot sometimes by changing policies rather capriciously. When that happens, investors think we can't price this and walk away."

AGRICULTURE, FOOD AND BIO-BASED PRODUCTS

9 November 11:15 am-12:15 pm

Claude Leprêtre, General Manager of Eurocob, gave an initial presentation. He described biomass as a bridge between agriculture and industry. His company, with two factories in France and one in Hungary, is in a niche market. It processes some 30,000 tonnes of corncobs a year. He treats them as a valuable dry raw material which can be stored and processed over a long period and given added value. The finished products can be used for a variety of purposes: pet litter and animal bedding, ingredients for cosmetics, polymers and feed and industrial absorbents.

He highlighted the problem of consistency between the EU's energy and bioeconomy policies, drawing attention to the subsidies the former can attract. In 2008, he had warned the French government not to distort competition by subsidising biofuels. "Despite my various warnings, I was not heard," he said. He estimates about 25% of French usable corncobs were withdrawn from the market as a result. "It is a pity because I think we can get more from this biomass than burning it." He called on the Commission to be aware of possible conflicts of interest when considering subsidies since no investor will support research into processing biomass if they are not confident of a sufficiently long-term supply at a reasonably stable price.

Later, he explained he initially had found it difficult to identify universities which could help him develop the solutions he required. A breakthrough came when two years ago he joined Agri Sud Ouest innovation in Toulouse which puts universities and industrialists in contact with each other.

Siobhán Talbot, Group Managing Director of Glanbia, explained the genesis of the company's new products was economic. As a large cheese producer in Ireland and the US, it examined how to bring value to whey by-products. It gathered together teams with science, production and commercial backgrounds in incubator investment type activities within the company to answer the challenge. "We recognised there was potential for this high quality protein in a concentrated form and use it as sport nutrition that appeals to consumers. We were our own start up," she said.

While working with local universities and benefiting from infrastructure support, she stressed: "It is still ultimately about finding the best model to keep that entrepreneurial flair and start-up mentality while part of a large company."

Eric Sievers, CEO of Ethanol Europe renewables, said his company considers itself a start-up since it has only been in business for four years. With only some 150 employees, it has been able to leverage around 2,500 jobs, of which less than 10% are farmers. "When we talk about the bioeconomy, we often talk about farmers and the benefit to them, but the primary beneficiaries are rural communities," he pointed out.

The company enjoys access to new technology and a good relationship with banks on innovative financing. But the single factor, he identified, preventing it from employing more people or displacing more oil is "the lack of a policy environment that allows us to put together business plans that we would invest in". He singled out the biofuels market. Apart from his company, no investment in the sector has taken place in Europe for the past five years, he said.

The observation was endorsed by a later comment from the floor. This noted that investors consider the overall research and innovation landscape. If powers over the approval or ban of certain inventions are returned to national governments, as recently happened with authorisation of genetically modified organisms, investors may be reluctant to enter other areas in case the same changes take place.

Xavier Beulin, President of Sofiproteol, President of the Fédération Nationale des Syndicats d'Exploitants Agricoles and Vice-President of COPA, pointed out that biomass farming is not new. It has existed for over 100 years, providing food, clothing, heat and other benefits. He distinguished between short and long value chains. The former is the circular economy. This can be developed locally between agriculture, industry and other partners, giving meaning to the bioeconomy and creating a virtuous circle. The latter provide biomass supply.

Agriculture can help tackle climate change. Farmers produce greenhouse gas emissions, but may improve energy and environmental performance by storing those gases. He pointed out that the bioeconomy starts from the land, despite the tendency to focus on products downstream.

Mr Beulin later emphasised that alongside medium to long-term policy stability, the bioeconomy had to ensure all participants – producers, processors and consumers – are convinced they are benefiting. "If one group feels it is losing out, it is difficult to make a sustainable economy. It is important to explain to Europe's citizens the policy's aim and that it does not undermine agriculture's first priority of producing food," he said.

Daan Dijk, Managing Director Biomaterials Supply Chain, Rabobank, approached the issue from a banker's perspective. The bioeconomy, he said, was not about replacing oil, since Europe is not particularly strong in energy innovation. In contrast, it is highly proficient in the chemical industry and should, as "a top priority" use this expertise and its agricultural resources to reindustrialise the continent.

He argued that up till now, no public case had been made to promote the bioeconomy, unlike ICT and climate change. This must be remedied. The point was endorsed by an intervention from the floor, stating that all the research in the world would not attract investors if they are unaware of the sector's value. Mr Dijk pointed to the need for long-term incentives and policies to ensure a level playing field. "If we understand that this is good for farm income and good for job creation, we have to put in place a much stronger incentive structure. We see lots of big companies choosing other continents rather than Europe," he said.

The panellists offered their own assessments of the policies to best attract investment. Mr Sievers, given his experience of the renewable energy directive, suggested: "If I produce, you pay me, would be a good policy." The legislation did not guarantee a market for biofuels, but his company, and the banks that supported them, considered it as a statement of political will, which he claimed

was later found not to exist. "The important thing is political will and a policy that works as simply as possible," he suggested. Ms Talbot agreed with the need for a simple framework to support investment and for clarity on the objectives identified.

Mr Dijk listed the need for long-term incentives and strong policies to build the market – the formula used in the plastics sector. As technologies developing increasingly sophisticated uses of biomass become more mature and stable operating margins appear, he suggested the industries become bankable. He referred to market perception. If the EU is going to make the bioeconomy a pillar of its economic reindustrialisation, "then it is a good sign for the financial sector to come in". Every euro spent by the European Commission in this direction is a win-win situation since it also generates income tax and corporate tax.

Mr Beulin suggested the supply of raw materials was unlikely to disappear overnight, although he acknowledged that major fluctuations can occur on the agricultural raw materials market. He pointed out it can be difficult for farmers and SMEs with small projects to access EU funding, despite the large sums available since they had neither the necessary channels nor size.

Mr Leprêtre, in his niche market, approached the question from a different angle. He asked whether it was more efficient to give funding to ten or 20 start-ups working independently on the same issue, rather than provide a global subsidy to universities and research centres whose knowledge would then be generally available to any start-up to develop their products.

From the floor, it was suggested that the EU should follow the US lead and apply public procurement to bio-based products. The policy was proving successful across the Atlantic creating growth and jobs.

In the ensuing discussion, questions were asked about consistency of supply, cascading, coordination and cooperation between companies.

Consistency of supply: Mr Dijk emphasised the importance of building strong alliances across, and along, value chains, while ensuring some reciprocity, to ensure consistency of supply. "It is good for farmers. There is an economic demand. They can respond and make some money," he said. Ms Talbot agreed the bioeconomy had to work for all participants in the supply chain from the primary supplier through to value creation. The public should be educated about the sustainability of the new economic model. Mr Sievers approached the issue from a different perspective. A lot of farmers had been burnt when bioeconomy investments announced with great fanfare later did not materialise. "Farmers won't be the first movers. The risk has to be taken by the biotechnology/bioeconomy asset side and then it becomes easier," he said.

CascadingOn the issue of cascading, Mr Dijk pointed out that a farmer can earn about €1,300 per hectare making fuel out of biomass. But if the same material is used to make a base chemical, that rises to €6,500. "I do not say all that money goes to the farmer, but you want to integrate the sector."

Coordination and cooperation Ms Talbot maintained there had to be a balance between coordination and cooperation between companies. There will always be competitors in the same space. The infrastructure needs to be well managed and the relevant people brought together.

A farming representative suggested farmers feel they are being forced to provide cheap raw materials for highly successful companies to make serious profits. He called for a change of mind set to deliver ecosystems linking farmers and local communities to the relevant sciences to help develop a sustainable rural environment. Ms Bastioli, intervening from the floor, agreed. She pointed out that a focus on sustainable regions would solve Mr Leprêtre's corncob problem because the same raw material would be used for different purposes depending on a region's cultural heritage. EU funding could then be used to create networks between the different economic opportunities.

A suggestion from the floor was to set targets, such as 30% displacement of key materials by 2030, to encourage change, rather than working in a vacuum as at present. This could be accompanied by creation of a sectoral development agency, involving industry and stakeholders, to organise investment summits across Europe to generate political and legislative support for the bioeconomy.

Asked to prioritise one policy, the panel offered:

Ms Talbot: a simple model that brings together stakeholders, investment, researchers and producers, possibly on a regional basis.

Mr Sievers: displacing oil should be made the benchmark to measure success for chemicals and fuels.

Mr Beulin: boost the circular economy, focus on research and investor support. Europe needs to send a clear political message and communicate its goals. That clarity is currently lacking.

Mr Leprêtre: application of the SCAR (European Commission Standing Committee on Agricultural Research) hierarchy of five recommendations* to avoid conflict of biomass use.

Mr Dijk: existence of a long-term incentive structure and recognition of the importance of farmers without whom the bioeconomy will have difficulty developing.

- Food first: ensure the primacy of food security
- Sustainable yields: not harvest more than can be regrown before the next harvest
- Cascading: first use biomass for the option with the highest value
- Circularity: maximising recycling and reuse and minimising waste
- Diversity: use innovation to foster polycultures.
-

FROM FORESTRY TO NEW BIO-BASED PRODUCTS

9 November 12:15-13:15

Ilkka Hämälä, CEO of Metsä Fibre, presented the company's project to build the first next-generation bio-product mill in Europe. This had been flagged up by both Commissioners in their opening addresses. The value of the investment is €1.2 billion with 40% of the financing coming from the company's own funding and the remainder from outside lenders, including the EFSI and the EIB. The mill is the biggest ever forest based investment in Europe and North America. With annual production of over €300 million, the company's activities have a major impact on the Finnish economy.

Ten per cent of the present turnover is non-wood fibre. When the mill becomes operational in 2017, the bio-products' share of sales will rise to 20%. These include tall oil, turpentine, producer gas, bark, heat, electricity and sulphuric acid.

Mr Hämälä emphasised the need for extremely long-term planning. The mill's life cycle is around 35 years. This requires a strong core belief in future supply, products and markets. The first is partly made easier by the fact that a long-term material base is assured since Finland's forests annually produce more than is consumed. But a key message to European and Finnish politicians was the importance of stable policy making. He acknowledged a place for support structures and subsidies, but emphasised: "We base our business on market demand."

The panel was asked how forestry could feed into the bioeconomy, particularly since many holdings are of small size.

Aljoscha Requardt, Secretary General of the European Confederation of Forest Owners (CEPF), noted that that the bioeconomy's new market concept strengthens traditional activities. Forests are not simply about nature conservation and recreation, as many think. They have strong economic and social importance, providing new commercial opportunities in which his members are investing.

The organisation's key principles are to promote sustainable forestry management, a highly economically viable sector and protect ownership rights. There is an increasing number of private forest owners, particularly in central and Eastern Europe, but they lack the infrastructure and investment to make the best use of their resources to build a bio-regional economy in different ways.

Gunilla Saltin, President of Sodra Cell, said that customers focus on three issues when considering a product: price, performance and the environment. They all have equal weight. "On price, we have to find ways of producing these new products that are competitive with today's products. Product performance has to be better. We also need sustainable forestry for today's customers. That is not an issue because we have certification, but we have to make that known to the public."

Linda Zuidema, Campaign coordinator at FERN, said her organisation does not consider biomass to be an unlimited resource. As demands grow, it is necessary to prioritise its uses and determine

where it can provide the most benefit. The bioeconomy and the measures to support it should be considered within the wider context of a circular economy.

Nella Baerents, Sustainability Policy Director – Europe, Arizone Chemical B.V., said that an intelligent bioeconomy is more than energy. It is about using raw materials in the most intelligent way. Her company uses research and recommendations from the Commission's Standing Committee on Agricultural Research (SCAR) as it seeks to balance the different competing uses for materials. She criticised tax policies that encourage burning of raw materials, describing them as short sighted and hindering creation of a real European bioeconomy.

In the ensuing discussion, Mr Requardt pointed out that the forest-based industry is growing and the discussion about sustainability is not new. The sector has practised this for years. The bioeconomy "is not just about fancy new industries and products" but also about investing in those products which already exist and help to decarbonise the economy.

He maintained that the EU should not overly interfere in forestry. It should develop "motivating and inspiring policies" that ensure regulatory coherence and consistency for the forestry sector. It should not regulate feedstocks. "So, we are not in favour of the cascading principle."

Mr Hämälä explained that it can take 80 to 100 years for a tree to reach maturity, so Finland and Sweden use natural forests for multiple purposes. Science is necessary to ensure that the whole operation runs smoothly. Picking up on the cascading point, he suggested it means different things to different people. He personally supports its use, but stressed that it should be market, not legislative, driven to produce the most valuable items.

It was pointed out from the floor that mature trees in northern Europe can contain as many as 5,000 compounds. These can provide major health benefits, but are not sufficiently explored or exploited at the moment. Another participant reminded the audience that forests are not simply about wood or a source of biomass. A huge array of non-wood forest products exists and these should find their way into bioeconomy discussions since they provide major potential for rural economies.

In concluding, Ms Zuidema called for caution in the bioeconomy debate. She pointed out that there had been a policy of incentives for using solid biomass for energy. This had led to forest destruction and in the end, she suggested, been detrimental to the advance of the bioeconomy as a whole.

Mr Requardt said if the EU really wishes to progress the bioeconomy, it should be built on European domestic feedstock supply. The new EU rural development programme can help finance some of the infrastructure needed, but further investment is necessary to encourage cooperatives and producer groups and to provide seed capital in regions requiring it.

Asked what single policy would most help the development of the bioeconomy, Mrs Baerents said the EU should avoid market distortion by not supporting any particular technology, sector or industry. It should allow resources to be used in the most efficient way to increase value, employment and growth.

For Mrs Saltin, forests should be used responsibly. She noted that when tackling climate change and developing the bioeconomy, there are some difficult trade-offs. As a result rules and regulations should be in place to ensure this responsible use.

Mr Hämälä emphasised the need for a level playing field for different industries. This should be accompanied by the necessary infrastructure and supportive legislation to ensure forests are utilised sustainably.

LOOKING AHEAD: THE MARINE AND THE BIOECONOMY

9 November 14:45-15:45

Jean-Paul Cadoret, Managing Director of Green Sea, presented his company's activities in producing marine ingredients from macroalgae and microalgae. He predicted a bright future ahead for algae, but pointed out that developments are still at the pioneering stage. Microalgae, as such, are not new reviously, they were used by very poor populations, while now it is the rich who buy their health enhancing bio-products from pharmacies.

He explained that working with microalgae is like having your field in a tank. You are able to control and adapt it without having to worry about the weather. The single most important problem

he admitted is cost, particularly of the water which is an essential part of the process. "We have a price problem, but we are pioneers so we have everything to do," he said.

Mr Cadoret pointed out that microalgae have a whole range of uses: human and animal nutrition, nutraceuticals, health, energy, cosmetics, industrial and environmental. It is also an important source of fatty acids which may become even more important if fish stocks, currently the major source, become depleted. "We can make almost everything. We just have to find the business model," he said.

Integration in a bio-refinery so that everything in the algae is used will be highly important in the future. He gave details of a project in France which uses slurry to produce methane to produce algae – a genuine circular economy.

Asked how to find a business model for so many potential products, Mr Cadoret replied: "I'm not sure there is a rule on that." He welcomed big companies coming into the field, since they bring some legitimacy into what is still a very new scientific world.

Peter Van den Dorpel, CEO AlgaeLink NV, echoed Mr Cadoret's view that the potential of microalgae is huge. "Microalgae are non-controversial, so there are no first or second generation food or fuel dilemmas. That is a very good environment to be in," he said adding that policy makers are unlikely to change their minds every four years or so when they see the successes.

Lara Barazi-Yeroulanos, CEO of Kefalonia Fisheries S.A. talked of aquaculture, explaining that farming the sea is a relatively new industry, still heavily dependent on science, research, technology and the environment in which it operates. "We are still finding out what are the best species to grow and the best ways to do that in the most sustainable manner," she said. A lot of progress had been made in the past 40 years, but she accepted some mistakes had been made because of a lack of knowledge.

Helena Vieira, Marine biotech expert, University of Lisbon, Science Faculty, started her own company and currently works with a Portuguese platform for blue bio-technology trying to grow the sector nationally. Being a university professor as well, made her aware of how she could speed up research output and facilitate its take up, she explained.

Gesine Meissner, Member of the European Parliament, President of the EP Intergroup Seas, Rivers, Islands and Coastal Areas, explained how the group, with over 90 members, tries to influence the blue economy's potential in a sustainable way. Algae is part of that development. She noted that the aviation industry has high hopes that algae could be a future energy source. "We try to raise awareness of the ocean's potential within a good policy framework," she explained.

Mr Van den Dorpel said that algae, unlike some forms of aquaculture, do not need to be beside the sea. They can come from fresh or sea water, but since most water is saline, it is better to locate the operation close to the coast. That is why spatial planning is important, Mrs Meissner pointed out so that algae seaside production does not interfere with energy, electricity grids or other features.

Mrs Vieira admitted that putting algae researchers in touch with the people and the products they could develop can pose a problem. There has been a clear evolution in the EU's overall research programmes over the years. Horizon 2020 places a clear emphasis on multidisciplinary cooperation. The academic drive to explore the ocean needs to continue, while at the same time industry is coming closer to academics. "The question is what do academics want to do and want does the market need them to do? You need to find the space where they can both flourish and work together," she said. This could be done by developing 'useful' science through collaboration within an appropriate business model which includes fast-moving start-ups within the consortium.

Asked whether coastal communities should be involved in blue growth initiatives, Mrs Meissner pointed out that blue growth is part of the integrated maritime policy. Its aim is to bring all stakeholders together to examine the potential of marine resources and determine how they could be brought forward in a sustainable way.

Mr Van den Dorpel noted that the best way to attract investment at a high risk stage of algae development is to demonstrate it. "Both investors and end users want to see it demonstrated," he said. That requires small scale demonstration plants. Validation of these pilot projects prepares the ground for further scale up. The investment for those pilot models tends to come from venture capitalists and business angels. "They are around. They are very smart and they know the future potential of algae. But they want to see it validated and demonstrated."

Mr Cadoret added that attracting investment for the scaling-up stage depends to some extent on the products in question. "If I go to a big company and say I have a molecule you are interested in, they will pay. They will help us to scale up." His company has already achieved a good industrial level and has a production process.

Ms Vieira disagreed with Mr Van den Dorpel over access to venture capitalists. In her view, they do not exist in many parts of Europe and, where they do, they tend to be risk adverse. "To get a venture capitalist or business angel to invest that early, it is not going to happen for the majority of start-ups," she maintained. As a result, demonstration finance must come from joint public/private finance. The microalgae market is becoming highly specialised and is similar to the pharmaceutical model. "If you have a good market in a niche market, it is going to be an easy product after it is validated."

Mrs Bari-Yeroulanos suggested that the main barrier to securing greater investment in aquaculture is legal: access to space and recognition of equal rights as a user. Fish farming is subject to agricultural and environmental risks, is rather capital intensive and long-term. "All these things together make it perhaps less attractive than other food production industries," she said.

Asked whether rigorous environmental standards would help encourage investors, she pointed out that standards already exist, although many people may not be aware they do. However, there are very diverging views on what is considered sustainable protein production. It would be helpful if scientists and legislators could agree on standards in this area and then ensure the aquaculture community lives up to them.

Mr Cadorret explained that one of the big obstacles microalgae face is "the novel food problem". In this debate, algae were forgotten and placed in the wrong list when the legislation was agreed. As a result, the industry is operating globally with different rules. Only three microalgae may be sold as food in Europe, despite the fact tens or even hundreds of thousands of algae exist in the world.

The microalgae sector has a good working relationship with the EU, but he appealed to policymakers to help it overcome the novel food problem. He put his plea in context: to place new algae on the market takes about €1 million and ten years.

The panel was invited to identify policies that would increase investment.

For Ms Vieira, it is necessary to have more investees, a critical mass of start-ups and to promote failure as part of success. This dynamic is lacking in Europe and should be promoted in a young sector, like marine. She suggested that possibly more incentives were needed to promote start-up projects between academia and industry.

Mr Cadoret stressed the importance of triggering originality. He worried that there is a tendency to finance things that already exist. He invited national and European financing bodies to take a little more risk and support projects developing new ideas. Asked about competitors, he replied: "I'm not in competition with agriculture and others, but with China and the States." Ms Vieira agreed that Europe's competitors are countries that do not respect standards and the highly innovative economies in the US and Asia.

In the discussion that followed, one participant emphasised that clear and understandable dialogue between research and industry could help close the gap. An interpreter could help to find this common ground. That individual could perhaps come from industry since many former researchers have gone in that direction, while movement the other way has been less prominent.

Another, stressing that market demand is the main driver for investment, identified the major barriers to investment as legal: spatial planning, licensing and food standards. With many food markets closed to macroalgae, he urged the relevant authorities to intervene to remove the restrictions. There was also a suggestion from the floor to play down the differences between the blue and green bioeconomy, since the biomass used largely contains the same molecules. The way ahead is to utilise these materials together.

Mrs Barazi-Yeroulanos agreed that legal status is a problem, especially where and how production make place. Another obstacle is long licensing procedures. These can take three to five years in Greece. She pointed to the need for a level playing field, noting that the EU sometimes has tougher standards for European produced food compared to third country imports.

Mrs Meissner extended an open invitation to all present to contact her if they wished to raise any bioeconomy issue. She emphasised the need to raise society's awareness of the marine sector, since it is young and largely unknown, to attract investors. "If we wait until demand is there, it

could be too late. We need to push demand," she said, suggesting that EIB resources should be used to help boost the blue economy.

Mr Van den Dorpel underlined the importance of cost effectiveness. This needs to be accompanied by a flagship project which can be scaled up to test the water, and in the process dramatically reduce the cost of the technology involved.

Mr Cadoret pointed to the difference between European and American biotech companies. The latter are far more competitive.

FROM BIO-WASTE TO BIO-BASED GOODS AND SERVICES

9 November 15:45-16:45

Alan Werker, Manager R&D, Cella Technologies at Anoxkaldnes, spoke of the Phario project his company is involved in some 60 kilometres North of Brussels. This integrates essential water quality treatment services, while producing renewable resources. It combines fundamental research with a highly practical outcome with waste water used to develop a polymer rich biomass.

Mr Werker explained what he means by biomass, since it means different things to different people. "I'm talking about the bacteria which are produced as a natural consequence of treating waste water."

The Phario project is based on a full scale plant, treating the waste water of around 500,000 inhabitants and producing some 2,500 tonnes of organic material as biomass. The company recently unveiled its first kilo of bio-plastic. Mr Werker explained the process of recovering the polymer from the biomass and compounding it into a bio-plastic. The waste water treatment is a full scale project, while the polymer production and recovery are at a pilot stage.

The project is using several stepping stones to reach its aim of using water treatment to achieve wider regional economic development. A demonstration project is planned for 2017-2018 with the first commercial value chains beginning in 2019. Mr Werker acknowledged that public perception of using bio-plastics from waste water, despite strict safety and quality standards, is an important hurdle to overcome and so it is important to pick their right application.

Miapetra Kumpula-Natri, Coordinator of the EP working group on the bioeconomy (EP Inter-group on Climate, Biodiversity and Sustainable Development), applauded moves to use waste as a business opportunity. Demand for bio-products produced from waste is based too much on price alone. To offset that, the products should be better than those available from existing easy methods or be eligible for some form of compensation, she suggested. She asked whether there should be some promotion of bioeconomic products or, echoing an earlier point, follow the US, on its positive public procurement policy.

She noted that many people fear the environment and nature will be damaged by moves towards the bioeconomy. Whereas something 'bio' is considered good in Finland, many parts of Europe are more wary of the term. People should be better informed of the technological developments and given a guarantee of the quality of a bio-product, she said.

Jesús López, Vice-President for EU Affairs and IR, Abengoa Bioenergy, explained how his company is using solid municipal waste to distil ethanol and other bio-chemical products. The processes involve many different scientific activities: biochemistry, agricultural knowledge and marketing. "That is one of the good things about the bioeconomy: having this shared knowledge which encourages lots of different ideas that later could have results in other areas," he said.

Ward Mosmuller, Director of Corporate public affairs, DSM, maintained that waste should be seen as residues or input for the next production stage. "Waste does not exist. We can use much more from the land than we did in the past. That is what the bioeconomy is about," he said. Biofuels are only at the start of exciting developments. "Oil is now 100 years or so old, we are just 10-15 years old. So, give us a break. Let's make sure that we have the time to develop." He pointed out that Europe exports much food and imports energy. If it wishes to be more self-sufficient, the bioeconomy and circular economy are one way to get there.

Thierry Stadler, President of IAR (Cluster Industries and Agrossources), explained the concept of competitive clusters. The organisation, with some 300 members, based in Northern France, promotes the development of bio-based products and bio-refineries. The approach offers opportunities for integrated treatment of waste. He gave the example of a sugar beet factory. Part of its waste water is used in a nearby plant that produces starch. Its waste water is used in a third

plant producing bio-ethanol. Some 70,000 tonnes of the CO^2 emissions produced are captured annually by another company and used for drink and food. "So you can see you have synergy in a bio-refinery between the different companies."

To be successful, Mr Mosmuller maintained three factors have to be addressed: raw materials, markets and policies. Sometimes they come together. They did so first in the US which is why his company started there on a commercial scale. Europe, he said, needs to start with a good definition of what is meant by a bio-base and standards. Public procurement would really help to build the market. He proposed binding targets be established at EU level, "otherwise you will go from one member state to another and not be quite sure what you are facing". Bio-ethanol might be one place to start. Fourthly, there needs to be reliable access to feedstock in general at a competitive price. That would require organising agriculture in Europe in a more structured way than at present and a system where all the component elements (policy, infrastructure and agriculture) come together.

Mr López agreed. His company located its second generation plant in Kansas with its abundant supply of corn. Yet, corn is also available in many parts of Europe and the company will soon be announcing new development plans. He raised regulatory support, saying it does not exist in Europe, nor are there any binding targets – only some voluntary national ones. "This clearly does not support investment."

Mr Werker pointed to the benefits of bringing forward some flagship demonstration projects. These can feed both supply and demand, while generating awareness of the value of waste and how it can best be utilised. Practical examples can be the thin edge of the wedge, helping to focus attention on enabling factors such as public/private partnerships and the necessary legislation.

Mr Stadler pointed to the need to harmonise different national legislation. He gave the example of bio-gas. After it is produced, it leaves digester, which is suitable as a fertiliser. French legislation makes it very difficult to use in this way. But if exported to Belgium, it is considered as compost and may be used as fertiliser. His point was later echoed from the floor with one participant pointing out that current EU bio-waste legislation does not include forestry or agriculture residue and many other forms of waste. Nor is it possible to transfer from one member state to another waste above a certain volume. These provide barriers for the development of bio-waste refineries.

Mrs Kumpula-Natri agreed on the need for an internal European market for biofuels. Finland, she pointed out is going for 20% renewables and hopes there will be a European policy for the transport sector, not just for electricity.

The panel was asked from the floor how they saw the relationship between the bioeconomy and the circular economy.

For Mr Stadler, the two reflect the concept of a cluster where the aim is to work with the whole value chain. It starts with the farmer and agricultural cooperatives and gradually grows to involve the agri-industry and chemical companies.

Mrs Kumpula-Natri would like them go hand in hand, but envisages some difficulties. She pointed to growing questioning from environmentalists of CO^2 neutrality for biomass. Critics also consider that energy is leakage from the circular economy.

Mr Mosmuller pointed to the need for harmonisation: take what exists nationally and pull it up to the EU level so companies knows what they are dealing with when going from one member state to another. Otherwise, national regulation can be seen as a barrier in an open market like Europe. A standardised definition of waste, and its treatment would simplify life for companies.

The moderator asked the panel how the waste water treatment sector could become friendlier for start-ups, given the large investment required. Mr Werker explained he had begun as a start-up-style SME looking at how to turn a problem into an opportunity. Instead of trying to reduce sludge from the treatment, he had looked at how to increase its use for other purposes. He had interacted with different universities since sometimes the solution may not be a single idea, but a mixture of inputs from the melting pot.

Mr Mosmuller pointed out that the initial idea often comes from a start-up company – the technology his company is using in the US is a case in point. But start-ups cannot do it alone. They need partners. Europe is good at knowledge and academic research while bigger industries are there to translate the ideas into innovation and eventually production facilities. Europe has several pilot facilities where university science is bridged with industry innovation.

One audience participant expressed concern about bioscepticism in politics. Mrs Kumpula-Natri acknowledged that environmental protection is sometimes held up in opposition, but maintained the bioeconomy case must be made across policies. "I strongly believe that the bioeconomy is environmentally friendly," she said floating the idea of a bioawareness campaign.

The panel offered their recipes for unlocking the EU's leadership in the 21st century bioeconomy:

Mr Stadler: give time to science. Find solutions before making regulations since often legislation is made before the solutions are found.

Mr Mosmuller: ensure things come together: standards, targets and public procurement.

Mr Lopez: increase growth in rural areas and focus on the bioeconomy since it is the first step towards a circular economy.

Mrs Kumpula-Natri: Europe has been good on agricultural policy and consumer protection, but needs to be shaken up a bit on innovation.

Mr Werker: We are talking about a material flow and the transformation of elements in that flow. To do that, you need various organisations working together. Trust and relations between people are important. You need real case examples and flagships to really test and drive the whole thing.

FACILITATING INVESTMENT IN THE BIOECONOMY

9 November 17:15-18:15

Jyrki Katainen, Commission Vice-President for Jobs, Growth, Investment and Competitiveness, addressed the conference by video link. He pointed out that the bioeconomy, while a relatively new sector fits in very clearly with the Commission's number one priority: jobs and growth. The Commission's Investment Plan for Europe, in particular the EFSI, offers major opportunities for the bioeconomy. The EFSI supports bio-refinery construction. The EIB, backed by the EFSI, is already providing finance to Finland's new Metsä fibre mill.

Innovative start-ups and fast-growing companies require finance for the different phases of their life. To meet that demand, the Commission is establishing a partnership with the EIB to advise bio-companies on how to access finance and increase levels of awareness and expertise. The European Investment Fund provides risk capital to companies in their seed and start-up stages. In looking at the regulatory environment, the Commission is identifying not just legislation that unnecessarily blocks investment, but is also considering ways of enabling investment.

Mr Katainen stressed that the bioeconomy must be seen as long-term. "We will not achieve the full potential overnight. That is why we need to pursue our efforts. The European Union, national and regional governments, industrial companies and consumers – we all need to contribute to growing the bioeconomy in the coming years." he said.

Mairead McGuinness, Vice-President of the European Parliament, admitted she felt not much had changed in dealing with the bioeconomy's key challenges since she had addressed a conference on the same subject in 2013. "There is a general perception that the bioeconomy has great potential, but no one is quite sure how we are going to pull it together," is how she assessed the current situation. She pointed to policy inconsistencies and continuing differences on issues such as food versus fuel. This has created uncertainty around the basic bioeconomy. Commodity prices and the price of oil also have an impact on thinking. The proposed circular economy package is an opportunity for the Commission to give a strong signal about the bioeconomy and where it intends to focus its development. She pointed to the need for different policies to compromise in a way that allows industry to invest.

Markku Markkula, President of the EU Committee of the Regions (CoR), said the Committee at its June plenary session had defined five priorities. Topping the list was sustainable growth and new jobs. The missing link is the motivation and mind set for entrepreneurship. Since investment in the bioeconomy tends to be large, what is needed is to gather many investors to share the funding and the risk. The CoR has identified some key challenges: to grow farmers' incomes by 40%; to create 80% more jobs in rural and underdeveloped areas; and to replace some 30% of oil-based chemicals. "This is crucial for climate change activities and crucial for innovation and to make the changes happen."

Carmen Vela, Spain's State Secretary for research, Development and Innovation, said the Commission's top down initiative to promote the bioeconomy was highly positive since it helped to

mobilise member states and can act as a catalyst. Her government has been working on a national bioeconomy strategy for over two years. This reaches down to regional and local levels. It identifies existing strengths and builds on agri-food, marine and bio-related activities which exist in 16 of the country's 17 regions. Overall, some 3,000 projects are up and running.

John Bell, Director of Bioeconomy, European Commission, DG Research and Innovation, responding to Mrs McGuinness, suggested a lot had happened since 2013. A new public/private venture is in place and part of the funding gap is being bridged. Most of the measures identified in the 2012 bioeconomy strategy have been delivered and the earlier abstract discussions have "gone from broad definitions into saying how do we make it actually happen". New communities are coming in to take ownership of the bioeconomy from the ground up. At the same time, it is necessary for EU governments to define their own national biodiversity strategies, as many are doing.

Mrs Vela elaborated on the thinking behind her country's national strategy. Public perception is extremely important, she said, responding to the bioscepticism point raised earlier. Her government has made communication, alongside financing and targeting on smart specialisations, one of its most important features. The strategy is adapted to the country's physical profile and societal needs. Water, which is not in abundance, is therefore earmarked for food production, not energy generation.

Mr Markkula noted that some 60 of Europe's regions have devised their individual smart specialisation development strategies and priorities. The task now is to encourage them to work closely together and develop specialisation partnerships, matching their complementary interests, and bringing in other players such as academia and vocational training colleges. It is a challenge the CoR has thrown down to its members. He invited the audience to identify specialist priorities in their own areas and to bring these, and their potential, to their own local CoR members.

Mrs McGuinness urged EU governments to follow the Juncker Commission's example of breaking down internal policy demarcation and insisting on more constructive departmental cooperation. She identified the need for NGOs and industry, each coming from their different perspectives, to try and develop a better understanding of the other's standpoint.

Responding to the earlier comment about public perception, she said she had yet to meet a constituent who had asked her how the bioeconomy is faring, although they do raise issues such as biodiversity and intensive agriculture. It is necessary to convince different sectoral interests that they have more in common than they might initially think and could benefit from working together. She acknowledged that much has happened since 2012, but that people are unaware of it and perhaps language needs to be adjusted to put the message across more clearly.

Mr Bell said there needs to be a biosociety to make the bioeconomy work. People need to be involved. He agreed on language, saying it should be more concrete and visual of what is involved. "We need to see the bioeconomy coming down to earth as it were." He pointed to the need for trust in society. This has to be earned. Perception of the bioeconomy, he suggested, can depend on where one lives. Farming and fishing communities which see it as another income source will probably work for it. He pointed out that various forms of EU finance are much more flexible now than in the past, providing wider opportunities, once the purpose of the funding is clear.

The bioeconomy and the circular economy fit together. "The bioeconomy is the biological motor of the circular economy. It is just to find a way of explaining that to people." He also stressed that there is no one single bioeconomy. There are bioeconomies.

Talking about regulatory predictability, he confirmed that the Commission is strongly aware the legislation it proposes, when approved by EU governments and the European Parliament, will be there for the whole investment cycle. It takes this into account, unlike previously, when revisions every three to four years were widespread.

Mrs McGuinness drew attention to a renewed interest in agriculture and food production, particularly among the young. This could help strengthen regional economies. "We are getting young trained farmers and that is our chance. This is the biggest opportunity that we have had in a generation because they will come with different skills and knowledge." The observation prompted a comment from the floor on the need for colleges and universities to develop more courses on the bioeconomy and its many implications for students.

Mrs Vela pointed out that the bioeconomy does not mean exclusively high tech and start-ups, but also traditional activities. It can include small companies or farms developing innovative products or different ways of doing things. "We need to cover the whole scenario from just routine innovation to really disruptive innovation. It is important to keep this concept."

Commenting on the certain amount of US envy which had been expressed during the day, Mr Sievers stressed that Europe had tremendous bioeconomy potential and "should be as good as it should and not try to be like the US".

The panel was asked to identify one priority to take the bioeconomy to the next stage.

Mr Bell: anchor it in the circular economy on the ground.

Mrs Vela: administrative and regulatory issues are the most important for investors, so there must be a very clear scenario.

Mr Markkula: construct a complex, multidimensional framework linked to university learning and R&D. This will bring societal innovations and societal solutions to societal challenges. Challenge CoR members in your regions and go to talk to them with your concrete proposals.

Mrs McGuinness: localise and deepen the discussions. She suggested a bioeconomy roadshow, possible with the CoR and stressed that agriculture is more than food, forestry is more than wood and seas are more than fish.

SECOND DAY

OPENING SESSION

10 November 09:00-09:10 am

John Bell, Director of Bioeconomy, European Commission, DG Research and Innovation, opened the proceedings by explaining that the day's programme would focus on what is taking place on the ground. "Today is about show and tell and looking at what is already happening," he said, adding: "It is really looking at how the real economy is unfolding and testing our ambitions against that reality. Today's a day for demonstration, realism and getting on with the agenda."

This would be achieved through an assessment of how EU policy towards the bioeconomy had evolved over the previous decade; presentation of a wide range of EU funded projects; and discussion of the financing opportunities available.

PANEL DISCUSSION

10 November 09:10-10:00

Chris Patermann, member of the BioEconomy Council, and the moderator for the session, recalled how he had been in the very same room a decade earlier with the then Research Commissioner Janez Potočnik. At the time, the concept of a bioeconomy was just "a research strategy and nothing else".

He briefly reminded his audience of the progress that had been made in recent years. In 2002, came the first biotechnology action plan which was later replaced by the biotechnology strategy. That was at a time when talk was of the knowledge society. The 5th framework programme introduced for the first time the cluster concept to encourage research, starting in life sciences. Also in 2002, the Gothenburg summit put the principle of sustainability on the EU agenda. From that year onwards, technology platforms, such as plants for the future and industrial biotech, began to be formed. As a result, technology suppliers, industry, academics and consumers were all brought together.

The combination of the cluster concept and the technology platforms laid the basis for today's successful public/private partnerships. "This is an organic line, we should sometimes take into account," he emphasised, adding that these were all elements of the *zeitgeist* at the time and that without them, there would be no bioecomomy. Later, Mr Patermann, pointed to the importance of Europe's regions for the bioeconomy. Ten years ago, they were not considered a key player in the debate. Now, they are crucial.

In addition, there was the idea of systemic, holistic approaches, which while always present, gradually became central to developments. All these factors contributed to a better use of biological resources, with biomass only coming later. This was followed by the German Cologne paper and input from the SCAR committee which was revitalised after being in the doldrums for

four decades. All this took place against a background where agricultural research was practically dead. As a consequence of the BSE crisis, only food research was taking place.

"Ten years later we have over 40 countries around the world which have bioeconomy strategies, roadmaps, action plans and programmes. The discussion includes concepts like sustainability and the circular economy…and the title of this conference after ten years is not research or technology, it is investment. What could prove better progress than this title? It is a state of maturity," he pointed out.

To launch the discussion, Mr Patermann tabled a few themes:

- What lessons could be learnt from the last 10 to 15 to 20 years?
- What were the most important drivers at the time? Are they still valid?
- What does all this mean for the role of Europe?

Nathalie Moll, Secretary General of EuropaBio, member of the European Bioeconomy Alliance, explained how her organisation had evolved from problem solvers into helping develop legislation, forward thinking and appreciating biotechnology's extensive potential. She pointed to the importance of the technology which can perform the transformative step to create bio-products. But nor would the products exist without the many links in the extensive chain. The bioeconomy is not like any other sector. It is a highly complex chain requiring farmers, feedstocks, transformers, producers of end products and a market.

When she had entered the sector, it had seemed like a good idea at the time, but now there is a reason. "The whole point is that we are driving change through the bioeconomy to avoid the 2° increase in temperature that we can't afford".

"So, there is a driving force right now. There are enablers and what is very interesting is that there is a very organised chain. In no other sector do I see such an organised chain from the producers of raw materials to the end producers of products. It's surprising to me and it is really exceptional," she said.

EuropaBio, she suggested that if the EU wished to take the bioeconomy seriously, there was no reason to exclude healthcare, as is the case at the moment, unlike in the US where it is included. While welcoming the commitment from DG RTD and DG AGRI to the development of the bioeconomy, she called for greater involvement from DG GROW since so many companies, particularly SMEs, are involved throughout the chain.

Prof Christine Lang, co-chair of the German Bioeconomy Council explained that her personal career development had very much mirrored the evolution of the bioeconomy. She had started by studying biology. Then, the concept of biotechnology did not exist. Later, it arrived and was followed by industrial biotechnology. The concept of the bioeconomy was still absent. When it did appear, it changed the landscape by bringing "something where you have the whole holistic view".

When biotechnology moved to become the bioeconomy, it became interesting for companies to become involved as research began to be translated into start-ups and innovative firms. It was during that transition that she started her company in Berlin in 2001. Five to ten years ago, the challenge facing the bioeconomy was different. Then, concern was about scarcity of resources and the potential end of fossil fuels. That started thinking on how to use biomass, in particular as an energy source. "We know today that this is not true and now we see that there is a surplus in fossil fuels now and in the future."

As a result, Prof Lang said: "We need to have a different kind of view of the bioeconomy – and I like this view much better. It is not just let's use biomass as an energy source because we don't have enough of other sources. But we have different challenges now." These are climate change and food security. Looking at what could be learnt from the past, she suggested that the latter is the main priority.

When she took up her current role as co-chair of the German Bioeconomy Council in 2012, the bioeconomy debate was often characterised as competition between food and fuel. This reinforced her realisation that all stakeholders should be involved in discussions on the direction the bioeconomy is taking and what the public expects from it. She pointed out that the bioeconomy flat, being presented in the margins of the conference, had been developed to provide the public with practical examples of every day bio-products.

To address climate change and decarbonisation, biomass use and bioeconomy processes and services are essential. The drivers here are innovation, SMEs as well as large companies. She drew attention to the demand side."We have to look at the bioeconomy as a market where people want

to have bio-based sustainable products. That is something the bioeconomy can deliver" she said. That combination of push and pull will help to drive investment.

Prof Lang identified four imperatives:

1. Coherent inter-sectoral policy with long-term goals and cooperation between ministries. Germany is already doing this with some success.
2. A possible incentive framework to bring money into the bioeconomy and encourage companies to remain in Europe rather than go elsewhere.
3. Investment in training, education and teaching, not just for students, but also for the public, banks and other institutions to demonstrate the bioeconomy's contribution to sustainable growth.
4. Dialogue with the public and stakeholders to nurture understanding of the bioeconomy and increase demand for its products.

Markus Norström, Business Area Manager, at the Technical Research Institute of Sweden, stressed the importance when dealing with the new complex issues that occur in bioeconomy value chains of working across established industrial structures with multidisciplinary teams.

He spoke of the importance of upscaling – an area where technical research institutes can provide crucial services. In the last three years, his organisation has opened three new upscaling centres in Sweden. They share the infrastructure with European colleagues. An umbrella organisation, the European Association of Research Technical Organisations (EARTO), brings together 350 different technical institutes. Their philosophy is that they are more competitive together than operating alone. This has spun off a smaller group of seven institutes working on a two-year bio-based economy programme. "We have chosen a few topics where we all possess strong knowledge which is complementary to each other and we share this openly in order to build something and take a common next step," he explained. These are: work on making sugars from cellulose, production of algae and development of high value products from algae and lignin.

The cooperation is not only reaping research dividends, but also helping to coordinate and use each institute's infrastructure and improve mobility for researchers, making it easier to establish bilateral and trilateral cooperation. These are steps towards a longer-term objective: development of a forum where the seven institutes will be able to work as one virtual organisation on the bioeconomy.

Mr Patermann made some preliminary observations from the opening round of comments:

- It might be worth considering broadening the bioeconomy to include health, and in particular microbial antibiotic resistance.
- How can science and research technology help make bio-products better, less expensive or more acceptable than traditional ones so investors will be encouraged to invest and the public appreciate the qualities of such products?
- Priorities are changing and the bioeconomy must adapt accordingly. It must demonstrate by explaining to banks and using education, training and other means, why investment is worthwhile and should remain in Europe.

Following the initial presentations, Mrs Moll stressed that policy coherence should be such as to encourage investment to take place in Europe, not elsewhere in the world. "Investments are chosen where the chain works best, where there is feedstock, and where policies make the most sense and are most predictable," she said.

While commending the Commission for going from a strategy to an action plan and a public/private partnership for the bioeconomy within one five-year mandate, she suggested more is required for the complex chain being put in place. Farmers need to have access to EU funding to create transport distribution networks and thought needs to be given to the potential ripple effects of other policies. If national governments are allowed to ban imports of GMOs, then investors may worry the same powers may be given over bio-products. "You cannot compartmentalise anymore something that is linear."

Prof Lang emphasised the importance of the EU investing in areas where it is strong, whether this be in regions, markets or sectors such as science and technology. She supported the idea of including health within the bioeconomy remit, pointing out that in her organisation's discussions with pharmaceutical companies they realised they had much in common and could benefit from joining forces.

Mr Norström introduced an additional element to the concept of a level playing field between energy and chemicals. This should be extended to fossil alternatives, he insisted, pointing out that International Energy Agency statistics show these are subsidised four times more than renewables. This must be addressed if there is to be a level playing field. "We should not let the main fight be between different bio-options, but between the fossil option and the good bio ones. We need plenty of solutions, not just one," he said.

A speaker from the floor thanked Prof Lang for addressing one of the elephants in the room: ensuring a sustainable provision of raw materials for the bioeconomy. This should be based on scientific facts and reason, not emotion, he insisted. How could this be achieved, he asked the panel. In reply, Prof Lang accepted this was an issue. She pointed to the need for greater efficiency in biomass production and measures to reduce the quantities of biomass that are lost due to faulty transportation and other reasons.

Another speaker suggested that the UN endorsed New Capacity Building Programme could be used as a model to bridge the communication and comprehension gap about the bioeconomy. The NCBP is a holistic, multicultural, integrated, interdisciplinary initiative in 140 countries to achieve and sustain national wellbeing. It is launching brainstorming sessions in those countries in a direct appeal for citizen participation; listening and talking to the public about their concerns, hopes and interests to create "a central element that is lacking everywhere: trust", the speaker said.

Mrs Moll gave details of the work the European Bioeconomy Alliance is doing nationally to bring together all actors in the bioeconomy – farmers, companies and producers. She suggested the concept could be reproduced regionally so there is support for research at all levels. At the same time, each of those actors has a responsibility to communicate the benefits of the bioeconomy.

At the close of the session, Mr Bell paid tribute to the leadership Mr Patermann had shown for over a decade in placing the bioeconomy on the map.

FINANCING THE BIOECONOMY

10 November 15.00-15.45

Waldemar Kütt, DG RTD, chairing the session, presented the panellists and opened the proceedings.

Christine Garburg, EIB, gave preliminary findings of the EIB study on access to finance for bio-based industries (BBI) and the Blue Economy (BE). It is constructed in three phases. The first identified potential projects; the second analysed funding obstacles and policy options to remove bottlenecks; and the third examined how to attract investment from financial markets.

The study confirmed that private funding is an issue for all the companies surveyed. Risk aversion and low return expectations restrain potential financing. In addition, the private financial community has a limited understanding and lack of expertise of BBI and BE. Regulatory uncertainty and the high volatility of earnings are also deterents. While public financial support in the form of grants is available, many project promoters considered them of limited availability, too small and difficult to secure because of complicated application processes.

Overall, there is interest in a potentially new public financing instrument with a strong risk absorption capacity and operating with more favourable conditions than currently exist.

The study interviewed 26 BBI projects with a total investment of €2.5 billion. Their average size was €100 million with an individual volume range of between €20 million to €500 million. Of these, 21 said they had issues finding funding, although 15 have already secured it.. Only 8-9% of the project finance came from private lending. The majority was provided by public loans, equity and grants. The same lack of private money was observed on the equity side. Out of the 26 projects, only one had private equity or venture capital. For the remaining 25, equity was provided by the industry or strategic investors.

The reason, Mrs Garburg explained, is that private equity or capital have difficulty in assessing the risks associated with BBI because of a lack of benchmarks. They also consider BBI to be an emerging industry and that industrial investors are better placed to assess investing in such projects.

When it comes to public financial support, it was noted that BBI projects are not of sufficient size, that the financing instruments available are generally too low and that the installations required are of suboptimal scope due to a lack of available funds. In addition, given the long periods of

negative cash flow, there is little willingness to invest in very high risk projects. The complicated application processes for public finance in general is also considered an obstacle.

Based on the preliminary findings, the EIB is proposing three initial recommendations. The first is the need for a more supportive market regulatory framework. This includes access to feedstock and possibly legislation requiring a specific amount of bio-based products to be absorbed by the market.

The second is to increase financial markets' understanding of the bioeconomy. This could be achieved through awareness campaigns, harmonised labelling standards and developing methodology to determine the economic and financial risk of bio-based industries and technologies.

The third could lead to the potential creation of a new public financial instrument. This would not involve grants. Instead it could provide grace periods to cover difficult times, lower interest rates, higher risk absorption capacity and possibly minimum revenue at the start of a project.

Piero Cavigliasso, Biochemtex, noted that with large investments, such as constructing a refinery, there should be 30% equity and 70% financed debt. He agreed that financial investors are more reluctant than industrial ones. There is more interest in large agricultural companies trying to valorise their agricultural products, biomass residues or waste, or in chemical companies looking to go green. Oil companies are also considering whether this is a good sector in which to invest.

"I totally agree that we should move the attention of the financing tools which are relevant and important to two very important things: access to markets and access to biomass," he said. Stressing that the necessary technology, mostly European, exists, he explained the questions investors ask. Where is the biomass? Who is going to sell the biomass? What is the cost of the biomass today and what could it be tomorrow? They also want to know the potential selling price of their biochemical or biofuel and where the market might be, considering today both are more expensive than equivalent oil based products.

He pointed out that the oil industry has no interest in buying something that is more expensive than gasoline, blended in quite a complicated way and distributed across the continent. However, he suggested that if there is pressure on it to use advanced biofuels, it will probably be the best investors since it has the finance and would be able to control a large portion of the value chain.

Massimiano Tellini, Intesa Sanpaolo Group, explained that the bank is looking at how to support its corporate customers' transition towards the circular economy. He considered, from a financial perspective, that the Commission is currently drafting an excellent framework for the bioeconomy and would like to see this converge with the design of the circular economy now taking place.

He suggested that many of the barriers identified in the EIB study stem from a lack of trust among operators along the value chain. "A stable regulatory framework for the bioeconomy and the circular economy would help in pioneering this kind of transition in a more concrete way." He called for new forms of collaboration between institutions, banks and clients and the creation of networks among the various actors in the value chain.

Mr Tellini considered the study to be of paramount importance since it could lead to a more coherent approach and concrete measures enabling banks and other key players, such as venture capitalists, to consider potential investments in more comfort. From a linear perspective, banks consider corporate customers to be a possible source of future risk. However, in the framework of the circular economy and the bioeconomy, financial institutions and regulators have a win-win interest in cooperating and finding ways to foster collective action at the highest level.

In the discussion that followed, Mrs Garburg, explained that the study revealed that product promoters were experiencing difficulties throughout the whole production chain. This ran from the input stage (access to sustainable feedstock), through the operational phase (permission to construct and run an operation) to the final output (unstable markets). She confirmed that the study is expected to be finalised in the first quarter of 2016.

Mr Tellini considered that bioeconomy companies are paying much attention to corporate governance and to the concept of a benefit corporation. The latter could be a model for companies to flag to investors, clients and customers, underlining their different identity and the competitive advantage they are aiming to achieve.

It was pointed out from the floor that, when it comes to access to finance, there are major differences between western and eastern Europe. The technologies, pilot and demo plans, investments and companies are mainly present in the former while many opportunities, such as biomass availability, forestry, agriculture, and regional and rural development finance are mainly in

the latter. However, companies are not investing there. How could a bridge be made between the two and the opportunities combined?

In reply, Mrs Garburg noted that investors still consider moving into eastern Europe to be a relatively risky venture. MrKütt reminded the audience that bio-based industries are still an emerging sector with new arrivals appearing every day. "Building the bio-industry is not only about getting access to finance and the regulatory environment, but also getting the players together, who up to now may not know themselves yet," he suggested.

Asked how to increase awareness among investors of the bioeconomy's potential, Mr Tellini suggested cities and municipalities could be an extremely useful vehicle for narrowing the gap between companies, investors and citizens. The development of smart cities and use of renewable energy would bring European citizens closer to the concept of sustainable development and efficient use of resources for both the bioeconomy and the circular economy.

The bank, he added, is playing an increasing role in knowledge transfer between SMEs and major corporations. This helps the former to understand the coherent structures of larger companies and the latter to appreciate how creative and energetic start-ups can be. "For us, this knowledge transfer is key to the transition to a bioeconomic system," he said, adding that this should be accompanied by greater investment in educational courses and research into the bio and circular economies.

Given the demands on proving bio-products are better than fossil produced ones, a participant asked how SMEs could possibly finance such studies given their cost and short shelf life. In reply, Mr Kütt referred to the latest two-year work programme of the societal challenges section of Horizon 2020. This contains a major project on life cycle analysis. The BBI is also financing demonstration and flagship projects looking specifically at life cycle analysis to prove the environmental sustainability of the new products.

CLOSING

10 November 15.45-16.00

Aldo Longo, Director of General Aspects of Rural development and Research, European Commission, DG Agriculture and Rural Development, drew attention to the many examples of successful research projects financed by the 7th framework programme which had been presented in the morning and afternoon sessions and thanked all those who had participated in the bioeconomic village. Their experience would feed into the Horizon 2020 work programme for 2018 to 2020 and beyond.

He noted the importance of intellectual property rights and suggested the Commission intensify promotion of the IPR help desk. From the proceedings over the two days, he also took the messages that investors require a stable regulatory framework for a minimum of some 15 years, and that innovative solutions must be used effectively for the benefit of Europe's economy and society.

Given agriculture's role as a cornerstone of the bioeconomy, the EU is implementing ways to bridge research and practice. It has put in place cross-cutting initiatives, such as the European Innovation Partnership agricultural productivity and sustainability. This is a bottom up collaborative process to make best use of complementary types of knowledge – scientific, practical and organisational.

Mr Longo drew attention to innovation project groups whose members come from various backgrounds: science, agriculture, advisory services, industry and NGOs. The first operational groups already exist in some national rural development programmes and their bottom-up projects will feed into the bioeconomy. Their activities will be given a European dimension through Horizon 2020's multi-actor approach.

In addition, the Commission launched a long-term strategy for EU agricultural research and innovation in June 2015. This is to be the subject of a conference on 26-28 January 2016.

In closing, Mr Longo encouraged everyone present "to seize the opportunity offered by the rural development programmes to build new bio-based value chains from agriculture and forestry".

ANNEX I: KEY MESSAGES FROM INDIVIDUAL SESSIONS

First day

Investing in the Bioeconomy

- need for regulatory predictability with long-term stability within a coherent policy framework
- sustainable regions provide a firm foundation for the bioeconomy
- agility and ability to act quickly are key factors of success
- start-ups provide real innovation, but they require support to scale up
- EU must maintain leadership in the development of the bioeconomy and set clear targets
- bio-chemicals, not bio-energy provide the best future opportunities
- public support is necessary for a successful bioeconomy.

Agriculture, Food and Bio-based Products

- need for consistency between EU energy and bioeconomy policies mework
- subsidies should not be used to distort competition
- large companies should aim to keep the flair of a start-up
- all participants in a bioeconomy chain must be convinced they are benefitting fairly
- a public case must be made for the bioeconomy as was done for ICT and climate change
- the EU should adopt a bioeconomy public procurement policy as exists in the US
- bioeconomy targets should be set for displacing key raw materials.

From Forestry to New Bio-Based Products

- long-term planning is essential in the forestry sector
- many forests, especially those with many small holdings, require infrastructure investment to make the best use of resources
- the bioeconomy should be considered within the wider context of the circular economy
- more attention should be paid to the many valuable compounds wood contains and to non-wood forestry products
- the EU should do more to develop its own domestic feedstock supply.

Looking ahead: the Marine and the Bioeconomy

- algae are a very versatile non- controversial raw materials at an early stage of bio-development, but with huge potential
- microalgae are becoming more specialised in niche markets, much like the pharmaceutical sector
- EU novel foods legislation should be revisited since it severely restricts the development of microalgae as food
- coastal communities should be closely involved in the development of the blue economy
- aquaculture's biggest hurdle in attracting investment areis lengthy licencsing and planning procedures
- legislators and scientists should agree EU-wide standards for sustainable protein production
- small scale demonstration projects are necessary to attract the interest of bioeconomy investors.

From Bio-Waste to Bio-Based Goods and Services

- attention must be paid to public perception of turning waste into bio-products
- bioeconomy developments face an element of political bioscepticism, especially from those who fear they damage the environment
- waste should be seen as an input for the next production stage
- the bioeconomy and circular economy can help the EU reduce its dependency on imported energy
- bio-refineries and competitive clusters can produce significant synergy
- greater harmonisation of national and European legislation on the definition, treatment and use of waste is necessary.

Facilitating Investment in the Bioeconomy

- the circular economy package provides an opportunity for the Commission to give a strong signal on the bioeconomy
- the Commission is playing a useful role as a catalyst with its top down approach towards the bioeconomy, mobilising member states and regions to develop their own strategies
- the vast majority of actions in the 2012 bioeconomy strategy have been delivered
- language on the bioeconomy should be clearer and more concrete, perhaps accompanied by a roadshow
- EU legislation must take account of the full investment cycle
- there is growing interest among the young in agriculture and food production
- the bioeconomy is not just about high tech and start-ups. It includes traditional activities with innovative products and techniques.

Second day

- Panel Discussionconsider possibly broadening the bioeconomy portfolio to include health - a sector attractive to investors
- examine existing public procurement possibilities and step up efforts to tackle obstacles
- communicate better the qualities of bioeconomy materials and products and increase understanding among banks of the bioeconomy's potential
- ensure a more level playing field is at the forefront of decisions to provide more equal conditions for investors
- provide incentives in regions to encourage their sense of ownership of the bioeconomy to help investment remain in Europe.

Financing the Bioeconomy

- an ongoing European Investment Bank study has identified overall interest in a possible new public financial instrument
- as a result, the EIB is considering recommending creation of a more supportive market framework, improvement in financial markets' understanding of the bioeconomy and development of public financing
- cities and municipalities could be a useful vehicle to bring companies, investors and the public together when considering the bioeconomy's future.

ANNEX II: RESEARCH PROJECTS PRESENTED DURING THE CONFERENCE

Agri-food

NAMASTE: using citrus and wheat processing by-products to produce food ingredients and new food products.
NOSHAN: sustainable production of functional and safe feed from food waste with nutritional value.
FOODMETRES: food planning strategies for metropolitan regions.
EUROPRUNING: development and implementation of a new logistics chain for biomass from pruning.
BIOCORE: a multi feedstock, multiproduct bio-refinery concept.
AGROCOS: novel plant produced compounds with agrochemical and cosmetic interest.

Forestry

Prolarix: botanical plant production agent from Larix by-products.
StarTree: optimising the management of multipurpose trees and increasing marketability and profitability of non-wood forest products.
INFRES: innovative, effective and sustainable technology and logistics for forest residual biomass.
WoodWisdom+: network of 23 projects with 255 partners in 12 countries.
Wobama: converting wood-based raw materials into a range of value added products.
Eco2Wood: developing practical solutions for calculating and optimising a building's carbon footprint.

Marine

ARRAINA: developing sustainable aquafeeds using alternative plant protein and lipid sources.
Securefish (discards): improving food security by reducing post-harvest losses in the fisheries sector.
MIRACLES (algae): developing integrated multiple-product bio-refinery technologies to produce high value specialities from algae for food, non-food and aquaculture use.
Bioclean: sustainable processes and solutions for biodegrading plastics and mitigating marine litter.
PHARMASEA: increasing value and flow in the marine bio-discovery pipeline.
Byefouling: low toxic cost-efficient environmentally friendly antifouling materials.
Marine Biotech: value enabler in the bioeconomy.
Bio-waste, residues and the circular economy
TRANSBIO: transformation of by-products from fruit and vegetable processing industry into valuable bio-products
BRIGIT: integrated biopolymers production from lignocellulosic sugar waste in sulphite pulping process for highly demanding flame retardancy applications
CHIBIO: bio-refinery turning fishery waste into value added polymers

The detailed presentations also included the following:

- Regional opportunities for investment in the bioeconomy: synergies between Horizon2020 and European Structural and Investment Funds
- Competiveness Cluster: industries and agro-resources, Laon Cedex, France
- Bioeconomy regional investments: the case of Navarra, Spain
- Role of Bio-based Industries Joint Undertaking
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  - Newfert: nutrient recovery from biobased Waste for Fertiliser production
  - First2Run: integrated biorefinery for sustainable exploitation of dry crops for biobased materials production

The conference included a bioeconomy village where a score of exhibitors displayed their wares and a bioeconomy apartment showcasing the increasingly wide range of bio-products being developed for daily use.

ANNEX III: PROGRAMME OF THE CONFERENCE

(click the image to open)

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KI-04-16-293-EN-N

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ISBN 978-92-79-57655-3