

April 2016

## Statement of the Lorentz BioPanel

### Summary

1. Biobased production of food, feed, fuels, materials and chemicals is necessary to reach global sustainability goals including climate change mitigation
2. A biobased economy can support human development and poverty reduction in developing countries by improving access to energy, food and income-generating opportunities, particularly in rural areas
3. Implementation of a successful biobased economy requires appropriate infrastructure for transport, distribution, storage and logistics
4. A transition from a fossil to biobased economy requires commitment, leadership and a multidisciplinary & multisector approach
5. International cooperation is needed to connect key credible actors, and align actions to accelerate the transition. Key enabling actions include sound communication, design and learning of regional implementation plans, globally aligned integrated research agenda, and organising global incentives.
6. The implementation of a sustainable biobased economy that improves energy and food security is an ethical imperative

# Lorentz BioPanel statement

April 2016

## Introduction

In January 2016 a group of experts from different disciplines gathered to discuss the urgency and possible actions to accelerate the move to a sustainable Bioeconomy. The following agreed joint statement builds on the latest insights on the global challenges and the role of biomass-derived energy and products for sustainable development.

The group explicitly recognises that production from fossil feedstocks comprises the biggest contribution to climate change effects and that fossil feedstocks need to be replaced by renewable resources. As confirmed in a growing number of reports and publications, such replacement is urgent and requires all available alternatives including solar-, wind-, biomass- and hydro-derived production of energy together with Carbon Capture Storage (CCS) and bioenergy combined CCS. Biomass is expected to play an essential role in the mitigation of GHG emissions and has a unique position for the production of materials, which cannot be (easily) replaced by other alternatives. In addition to materials, biomass also had a distinctive role in providing sustainable liquid fuels. It is useful to create this spotlight on the bio-based component, due to some unique relations with sustainability pathways, including rural development, energy- and food security.



Figure depicting biobased economy: <https://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy>

Definitions of a bioeconomy and biobased economy vary. The group used the following definition of the European Commission:

The Bioeconomy comprises those parts of the economy that use renewable biological resources from land and sea – such as crops, forests, fish, animals and micro-organisms – to produce food, materials and energy\*

A bioeconomy can be viewed as part of a circular economy, striving to carefully use renewable resources and re-use resources where possible.

The term Biobased economy (BBE) was used in this document to emphasise the focus on the replacement of fossil resources to biomass based resources

\*

<https://ec.europa.eu/research/bioeconomy/index.cfm>

# Lorentz BioPanel statement



April 2016

Because biomass is needed to provide food and feed, changes in biomass utilisation should be carefully assessed and managed in order to maximize sustainability benefits with respect to the environmental, economic, and social aspects.

The assessment and implementation of extended sustainable production of biomass and their conversion to food, feed, fibre, bio-based products and bioenergy is therefore complex and can benefit from multidisciplinary input. The workshop aimed to contribute to this and focussed on the role of biomass in the transition to a sustainable economy. It provided insights on values and worldviews; ethics; transition management; options for biobased technology development; economic consequences; sustainability issues; accountability, responsibility and policy options. The group, established as the Lorentz BioPanel, concluded that the positive contribution biomass can provide in the mix of renewable resources deserves more attention and has the aim of delivering an action plan for the sustainable implementation of biobased innovations. The Lorentz BioPanel urges world leaders to tap the full potential of biobased alternatives to fight climate change *and* help social development. This statement presents the joint vision, emerging understanding and identified key enablers and action points for sustainable biomass utilization. The purpose of this document is to broadly communicate this vision, invite further input and align biobased innovations with other renewable technologies to accelerate action for a transition to a sustainable economy.

## Vision statement

A shift from the present fossil economy to a biobased economy is needed to achieve key goals related to climate change, social and economic development, sustainable agriculture, a healthy environment and food security. Globally, we are not constraint by sunlight or by land availability. And so renewable feedstocks from plants and wastes can and must provide food, energy and materials for a growing world population, which will require a careful balance between economic aspirations and ecological constraints. A bio-based economy calls for a fundamental paradigm shift, a change in our foundational values, aspirations, and worldviews, to transform current patterns of unsustainable production and consumption and change the way fossil fuels are engrained in social, economic and political mentalities. Reaping the benefits of a biobased economy is made more complicated by the mixed signals arising from volatility in fossil fuel prices, which slows down the sustainability transition in agriculture and other sectors and makes mitigation costlier in the long-term. The debate thus should not be restricted to technological and economic potentials, but needs to include the social and political realities that constrain the pace of change. Current political and institutional regimes at national and international levels remain largely aligned with existing fossil-based economic structures. This gives rise to an urgent need for action from leaders in public and private sectors as well as civil society in order to create a level playing field that can reverse the dirty development pathways of the past. The implementation of a sustainable biobased economy as part of a circular economy, that improves energy and food security is not only an ethical imperative, but also offers an inspirational and therefore mobilizing vision of a more just and higher-quality future for all.

April 2016

## Emergent understanding

### 1. *Climate change*

The Paris climate objectives and the Sustainable Development Goals will not be achieved in the absence of a viable and thriving Biobased Economy (BBE) [1]. In particular, biomass is seen as a crucial contributor to achieving the new targets of a restriction of 1,5° C temperature rise. Wiser management of biological resources reduces wastes and fires, conserves biodiversity and water and recycles nutrients engendering healthier environments. Actions should be designed for both developed and developing countries in recognition that countries and regions differ in their needs and opportunities. Change is needed urgently, the longer it takes to reduce emissions, the more difficult reducing emissions becomes.

### 2. *Economy*

Taking the costs of adaptation to climate change effects into account, we are facing an economic crisis (*simultaneous climate, financial, energy security and related crises*) that dwarfs the credit crisis [1]. The economic system is based on fossil resources and use, changing this will inevitably bring large uncertainty and disruption. Limiting this crisis will require attention for fading out industries, trust building in replacing renewable business and taking risks.

### 3. *Food security and poverty*

In most locations hunger and malnutrition are not caused by a lack of food production or land. Instead, hunger results from poverty, poor governance, and a lack of infrastructure. Cycles of poverty result from mismanagement and undermine long-term productivity and resilience. The BBE can complement rather than compete with food production enabling more resilient supply chains and access to investment. This requires foremost a good infrastructure, providing access to land and its produce, storage, transport and markets; and options for development. Most Less Developed Countries (LDCs) are highly bio-based, but in a basic and unsustainable way. There is a need for more sustainable energy systems. Renewable energy based on biomass as well as solar, wind and hydro reconnects us with our environments empowering local people to engage with local resources reviving rural economies. GDP in LDCs is primarily from agriculture – mostly small-scale and rain fed, but presently little goes to the market. Case studies show that using surplus for additional income could help support local economies and agricultural development. Technological innovation and new markets are already inspiring young farmers to re-engage with agriculture, while subsistence farming is not appealing to the young and is inherently unstable. This requires a transition from subsistence farming to growing and selling surplus.

### 4. *Biobased production potential*

There is enough potential for biomass production and labour required for a biobased economy. Marginal and degraded land can be used and made productive, and techniques such as double cropping or integrated agriculture have been highlighted for its large productive potential, keeping present conservation areas and forests intact or even increasing them, but current land and (traditional) biomass uses are often unsustainable and contribute to climate change. Biodiversity conservation can be achieved and land use changes can be beneficial in multifunctional agricultural landscapes. In many areas water does not need to be a constraint since the majority of rainfall is presently not intercepted. This all requires well managed agricultural practices, based on appropriate evaluation of local conditions and contexts. Investments and policies that incentivize (improve) management and generate beneficial Land Use Changes are fundamental.

# Lorentz BioPanel statement



April 2016

## 5. *Diet choices*

Diet has a substantial impact on our environmental footprint, yet choices of food interlink with economic systems, both in developed countries as in LDCs. Such linkages need to be understood better and reducing meat consumption should be considered in relation to the local alternatives.

## 6. *Technological Innovation*

Innovation in biobased technology is crucial to improve the efficiency of biomass conversion for energy provision and broaden product portfolios. Private and public partnerships provide best-practices for technology development and deployment; they connect industry to knowledge and agricultural practices. Innovation-targeted research is crucial, as are long-term commitments to achieve clearly defined goals. Other sustainable technologies such as solar, wind, hydro, etc. should not be regarded as competitors but rather as complementary and there should be an openness to exploring potential synergies. However, biobased technologies have a particular appeal because of their potential to address sustainability issues on multiple levels and for multiple economic sectors.

## 7. *Level playing field*

Presently there are significant implementation **problems** because of the lack of a level playing field related to:

- Cheap and subsidized fossil resources reduce the use of more expensive biobased alternatives
- Underdeveloped infrastructure for biobased and other renewables (versus a fully optimised fossil one)
- Locked-in capital and associated risk perspective by potential investors
- Social acceptance of biobased and other renewables versus omnipresent fossil practices

## 8. *Transition challenges*

Transition to a bioeconomy involves social and technological changes. Tuned (further) development of technology, resources, markets, logistics, financial systems, and others is crucial. In addition to investment other actions are needed related to issues of risk, functional and cross-sector governance and culture. This transition requires multi-actor networks defining guiding principles, values and pathways, and keeping the persistent problem of continuous use and dependency of fossil resources on the agenda. Transdisciplinary networks help to identify and understand the problems and find solutions. It is necessary to understand that different cultures have different values and worldviews, which provide the basis for their acceptance, and willingness and directions of change to novel practices. A sufficiently powerful positive and persuasive vision for the BBE, including development of greater consensus and in some cases myth-busting is needed in order to coalesce critical mass for action.

## 9. *Joint responsibility*

Given the collective interest, there is a significant and joint role and responsibility for multiple stakeholders including leaders in government, business, financial, academic and NGO to advance the BBE.

April 2016

## Barriers, leverage points and key-enabling factors for change<sup>1</sup>

### 1. *Developed Countries*

Advancing the BBE faces major barriers because fossil fuels and materials are engrained into the arteries of modern economies. In spite of the increases in support for renewable energy of the past decade or so, fossil fuels still globally receive 5-10 times more subsidies. Today's infrastructure is based on fossil fuels and favours existing technologies and markets. Adapting this infrastructure to support the BBE is costly, complicated and fraught with competing interests in both public and private sectors. Governments have become dependent on the income from fossil fuels. Investors in BBE solutions continue to perceive significant risks as poorly implemented policies and regulations continue to send the wrong signals. The current low oil prices have further weakened the market signals and make the climate challenge more difficult to address. The supporters of the BBE, who are often newcomers without the skilled lobbying apparatus of the fossil industries, have also struggled to gain social acceptance and create a positive reputation. Non action poses a serious threat. This is not sufficiently understood. The urgency of supporting the BBE is thus not perceived sufficiently, and whilst peer pressure could function as a positive tipping point, sufficient actors need to be motivated to move. At the same time big companies who are prepared to change are perceived as suspect. The perception of a biobased economy is also troubled by the multiplicity of BBE solutions and uncertainty of the economic and social impacts. The existing Intellectual Property (IP) structure is also working against the BBE: Innovation is slowing down due to the influence of existing patent regimes.

#### *Leverage points*

- a. measures to stimulate renewable alternatives, such as carbon taxes and differentiated interest rates (high for fossil, low for clean energy/ BBE)
- b. changes in infrastructures from fossil chains to biobased chains
- c. stimulating open innovation and providing access systems to patent portfolio's for clean technology, also for developing areas
- d. creating changes in perceptions of BBE and the need for a sense of urgency for change

#### *Enabling factors*

- a. low interest rates of central and development bank (high for fossil, low for clean) instead of the current flat rate for all
- b. provide decision support tools for implementing BBE solutions for both (local/regional/national) governments and industry
- c. organise communication for social acceptance of (bio-)renewables versus omnipresent fossil – provide clear storylines and de-mythologise wrong assumptions; stress the sense of urgency and moral obligation to act, or the unethical side of inaction

---

<sup>1</sup> **Leverage points** are places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything.

**Enabling factors** are factors that make it possible for individuals or populations to change their behaviour or their environment include resources, conditions of living, societal supports, and skills that facilitate a behaviour's occurrence.

April 2016

## **2. Less Developed Countries**

Whereas the enabling factors in Emerging Economies can often be similar to those of Developed Economies, enabling factors in the Less Developed Countries (LDCs) can be quite different and more complex. The LDCs are less locked into existing infrastructures and thus in some cases they are better positioned to leapfrog in technological terms, such as was the case with mobile phone and solar technology. At the same time, they also often have underdeveloped institutions and an unskilled human resource base largely based on subsistence farming and livestock rearing. Agricultural practices delivering surplus for economic development require an infrastructure for storage, transport and markets. Transforming the existing bio-economy and the partially fossil-based economies that exist in parallel in LDCs into more sustainable renewable practices including modern and more advantageous biomass utilisation practices (as can be provided in a BBE) has special challenges and there are many additional requirements in terms of finding leverage points and implementing enabling factors. Inaction on implementing the modern BBE is particularly unethical in the LDCs because there is so much potential to emerge from the current hybrid of traditional biomass used and the fossil economy that condemns a significant portion of the population to poverty and resource degradation.

### *Leverage points*

- a. Avoiding carbon lock-in through sustainable infrastructure consistent with BBE, which involves lower cost due to the low level of existing fossil infrastructure, and needs to be based on a longer-term perspective. Support agricultural extension and investment – and highlight importance of the BBE as a driver of social enterprise at the local scale
- b. Encouraging natural indigenous talent and entrepreneurship (especially ICT) to develop transformative ideas into practice. Identifying, finding and supporting transformative ideas / topics and activities (avoid re-inventing the wheel)
- c. Drawing on existing markets, including traditional products e.g. medicines, foods, artefacts)
- d. Identifying key stakeholders e.g. decision makers / thought leaders / public sector / private sector / politicians / technologists, as change agents - can also be institutions e.g. SEBRAE ([www.sebrae.com.br](http://www.sebrae.com.br)) in Brazil
- e. Reinforcing existing centres for excellence for research and education in Developing Countries or create them where they don't exist

### *Enabling factors*

- a. Be location-specific, identify barriers in infrastructure and build required infrastructure, take cultural and social issues and values that impact social development into account;
- b. Ensure the prerequisites for development: Personal security, sufficient food and shelter – since people are in survival mode and need to get out;
- c. There is plenty of land and labor, but no market or technology – establish platforms to create technology and market channels;

April 2016

- d. Upgrade basic infrastructure for education and communication for sustainable agriculture and innovation in BBE continuously and (more) equitably;
- e. Establish strong institutions and legal structures for land and property that are enforced, so people can work and invest in the future;
- f. Organize access to markets (distribution), access to water and access to information.

## Recommendations for action

In order to accelerate the transition to a biobased economy organised action is needed to increase the learning curve and help implement the enabling factors. Recommendations for action:

1. Start an international **initiative to show the potential of biobased innovation**, help the sustainable introduction of biobased production and stimulate synergies with other renewable technologies for a transition to a biobased economy as part of a circular economy.
2. Involve **credible actors, benefactors and ambassadors** and organise a critical mass – **align already active organisations** in this field to strategically work together on developing positive visions of a Biobased Economy. And ensure independent advice on the ethical dimensions. **Explore activities of existing organizations** embracing initiatives for sustainable development. These include United Nations and their Sustainable Development Goals initiative, New Partnership for Africa's Development (NEPAD), United Nations, African Development Bank, European Development Bank, World Bank, International Monetary Fund, European Investment Bank, commercial banks and Philanthropists funds. Identify common goals and align with NGOs.
3. Liaise and **seek synergies** with stakeholders developing complementary renewable energy technologies.
4. Involve governments, business and NGO's to develop and implement **incentives to stimulate** biobased business development. Examples should be worked out in impact analysis. Take into account Economic, Infrastructural issues, Subsidiary, Scale wise, Risk perceptions, related to financial investors, dysfunctional circular policy incentives. Phase out (in)directly subsidising fossil & re-subsidise BBE with proper monitoring and mechanisms.
5. Define a **communication strategy** that highlights the ethical dimension for social development combined with the inevitable contribution of sustainable biobased practices to adaptation and mitigation of climate change. Address concerns and misunderstandings, and produce positive visions (showing human well-being and social development, in balance with nature) supported by monitoring and reporting on positive examples – use publications such as the reports of the World bank, SCOPE, Nuffield Foundation, European Group on Ethics and macro-economic studies[1] as a starting point. Engage academia in developing countries and advisory capacity so that advice at high level is grounded and does not remain exclusively from developed world.
6. Design **regional implementation plans** in partnership with local leaders and stakeholders for introduction of Biobased practices and structures such as cooperatives and others, adapted for (to) local situations in developing countries that fulfils the vision (see Box 1 and 2. This

April 2016

should address infrastructure improvement as a first point with timeframes, costs and actors (see Box 3). Connect chains of industry (such as food companies to energy) that can benefit together. Monitor and adapt to create portfolio of case studies for learning affect.

7. Set up a globally aligned **research agenda** for locally-responsive technology development and socio-economic studies on the interconnectivity of economic drivers, which show economic and GHG reduction effects in reducing the use of fossil fuels. Get better insights in social systems and interrelation to energy and production infrastructures, including dependency on fossil feedstocks. Ensure learning effects are communicated.

## References [1]

1. IPCC report 2014;
2. Report of the Subsidiary Body for Scientific and Technological Advice 2015. SBSTA, UN-FCCC <http://unfccc.int/resource/docs/2015/sb/eng/inf01.pdf>;
3. World Energy Outlook, IEA; Global Energy Assessment (2012);
4. Overview IIASA: J. Rogelj et al.: *'Energy system transformations for limiting end-of-century warming to below 1.5°C'*, Nature Climate Change, 2015, Vol. 5, pp. 519-527
5. SCOPE report 72 "Bioenergy and Sustainability: Bridging the gaps"; Ed: Souza GM, Victoria R, Joly C, Verdade L (2015). 779 pgs. Paris France. ISBN 978-2-9545557-0-6. <http://bioenfapesp.org/scopebioenergy>
6. "Shock waves: managing the impact of Climate Change and Poverty" (2015); and "Turn down the heat" (2013): <https://openknowledge.worldbank.org/bitstream/handle/10986/22787/9781464806735.pdf>; <https://openknowledge.worldbank.org/bitstream/handle/10986/22787/9781464806735.pdf>; <http://documents.worldbank.org/curated/en/2013/06/17862361/turn-down-heat-climate-extremes-regional-impacts-case-resilience-full-report>
7. 'Macro-economic outlook of sustainable energy and biorenewables innovations' MEV II, LEI Wageningen UR and Utrecht University, December 2015
8. Nuffield report on bioenergy: <http://www.nuffieldbioethics.org/No.66>;
9. Ethics of Modern Developments in Agricultural Technologies, EGE, [http://ec.europa.eu/bepa/european-group-ethics/docs/publications/opinion\\_no\\_24](http://ec.europa.eu/bepa/european-group-ethics/docs/publications/opinion_no_24)
10. J. Rogelj et al.: *'Energy system transformations for limiting end-of-century warming to below 1.5°C'*, Nature Climate Change, 2015, Vol. 5, pp. 519-527;

# Lorentz BioPanel statement



April 2016

## Undersigned by:

*Prof. Isabel Arends, Head Department Biotechnology, Delft University of Technology, the Netherlands*  
*Dr. Lotte Asveld, Ethics and philosophy, Delft University of Technology, The Netherlands*  
*Prof. Mieke Boon, Philosophy of technology and engineering science, Twente University, The Netherlands*  
*Prof. Jacqueline Broerse, Science communication, Free University of Amsterdam, The Netherlands*  
*Dr. Dorette Corbey, Chairman Commission Corbey, advising parliament on sustainability, The Netherlands*  
*Sir Prof. Brian Heap, Former Foreign Secretary Royal Society and Master St Edmund College, Cambridge University, United Kingdom*  
*Dr. Francis X. Johnson, Senior Research Fellow, Stockholm Environment Institute, Africa Centre, Kenya*  
*Prof. Julian Kinderlerer, Chairman EGE, Biochemistry, law & ethics, University of Cape Town, South Africa*  
*Dr. Keith Kline, Environmental impact, land use models, Oak Ridge National Laboratory, United States*  
*Dr. Laurens Landeweerd, Philosophy of technology, Radboud University, The Netherlands*  
*Dr. Pieter Lemmens, Philosophy of technology, Radboud University, The Netherlands*  
*Prof. Derk Loorbach, Socio-economic transitions, Erasmus University Rotterdam, The Netherlands*  
*Prof. Lee Lynd, Chair Global Sustainable Bioenergy Initiative and Dartmouth College, United States*  
*Prof. Ellen Moors, Copernicus Institute for Sustainable Development, Utrecht University, The Netherlands*  
*Dr. Ward Mosmuller, Global public affairs, DSM, The Netherlands*  
*Prof. Henk Noorman, Bioprocess Design, DSM, the Netherlands*  
*Prof. Patricia Osseweijer, Biotechnology and society, Delft University of Technology, The Netherlands*  
*Prof. Merja Penttilä, Synthetic biology and fermentation technology, VTT, Finland*  
*Prof. Arthur Petersen, Science, technology & public policy worldviews, UCL, United Kingdom*  
*Dr. John Posada, Integral sustainable biorefinery design, Delft University of Technology, The Netherlands*  
*Prof. Luciano Verdade, Co-coordinator BIOTA-FAPESP, biodiversity, University of Sao Paulo, Brazil*  
*Prof. Luuk van der Wielen, President BE-Basic, distinguished professor BBE, TUD, The Netherlands*  
*Dr. Annick de Witt, Worldviews, The Netherlands*  
*Dr. Jeremy Woods, Environmental impact, biomass availability, Imperial College, United Kingdom*  
*Prof. Emile van Zyl, Director Biofuels program, Stellenbosch University, South Africa*  
*Prof. Hub Zwart, Philosophy, Director Centre for Society and Life Sciences (CSG), the Netherlands*

Comments, suggestions and questions:

[P.Osseweijer@tudelft.nl](mailto:P.Osseweijer@tudelft.nl)

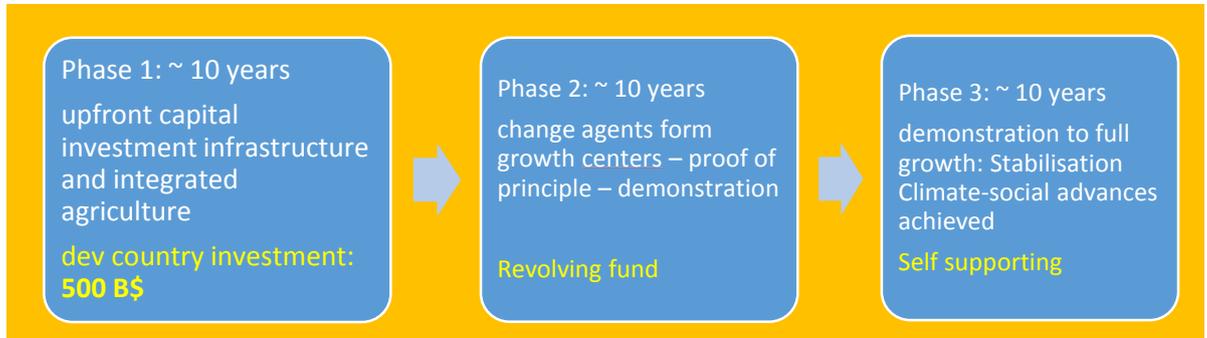
Royal Academy Netherlands Institute for Advanced Studies, Wassenaar, The Netherlands

2016

# Lorentz BioPanel statement

April 2016

Annex 1.



Box 1: Example scheme for Biobased Development in Developing countries: three phases to 2050

**Critical enablers in Phase 1:**

- Project embraced by (group of) owners (vision and means) and executors
- Owners: philanthropists; governments; NGOs; industry
- Executors: local champions and SHs with long term commitment supported by government (local) dev agents and interested businesses to help entrepreneurial skills; education; *protection and support is key*
- Critics: need to be engaged as SHs
- Provide rich portfolio of choices: technology and agri tools
- Deal with IP and licensing to ease introduction
- Start educating change agents of phase 2
- Set up revolving fund for phase 2 (address governance fund; IP licensing, etc)

Box 2: Example scheme for Biobased Development in Developing countries: critical enablers for implementation change to BBE

The BBE comprises the global accumulated markets for liquid fuels, other bio-energy products (biogas, bioelectricity), food and food ingredients, feed and feed products (dairy, meat), bio-materials, and other products made using the power of biology. Total market sizes for all these products now and in the future (today and 2035 or 2050) in one scenario could be:

	Today	2035 or 2050	
biofuels/biomaterials/bioelectricity/products	200	800	B\$/y = fast growth
wood/food/feed	600	1,000	B\$/y = doubling
fossil economy	1,600	800	B\$/y = halving
total economy (cumulative GDP)	80,000	160,000	B\$/y = 2%/y growth

Box 3: Market development scenario for BBE products

# Lorentz BioPanel statement

April 2016

## Annex II

### Establishing members of the Lorentz BioPanel, Leiden, the Netherlands, 22 January 2016



(Leiden, from left to right) Henk Noorman, Keith Kline, Isabel Arends, Francis X. Johnson, Merja Penttilä, Laurens Landeweerd, Ward Mosmuller, Emile van Zyl, Patricia Osseweijer, Ellen Moors, Jeremy Woods, Luuk van der Wielen, Luciano Verdade, Jacqueline Broerse, Arthur Petersen and John Posada. Not in the picture are: Julian Kinderlerer, Sir Brian Heap, Mieke Boon, Annick de Witt, Lotte Asveld, Dorette Corbey, Derk Loorbach, Pieter Lemmens, Hub Zwart and Lee Lynd.