

Challenges of Bioeconomy Implementation at Regional and Global Level

Position paper from the BBW ForWerts International Summer School 2018

Executive summary

- We, the participants of the BBW ForWerts summer school share the vision of bioeconomy as a societal transformation towards a sustainable bio-based economy. As young scientists, we are aware of the consequences of climate change and are knowledgeable about the key contributions bioeconomy can offer to meet this challenge.
- Today, we are exchanging experiences, aspirations, but also disappointments with fellow PhD students from different parts of the world (Brazil, Colombia, China, Germany, Sweden). Tomorrow, we will turn into change agents, in research institutes, industries, policy decision making or public administration. We are concerned and share a sense of responsibility, but we are enthusiastic ambassadors for a sustainable bioeconomy!
- We are convinced that for fostering the implementation of a sustainable bioeconomy it will be mandatory to improve and intensify societal communication at all levels. While the media could play an important role they have hitherto not lived up to our expectations. To convince different parts of society, there is an urgent need for convincing narratives, based on solid scientific evidence and adapted for different societal target groups: People have to be able to link bioeconomy transformation to their own life and daily experience.
- We feel that most current bioeconomy strategies turn a blind eye to socio-economic constraints. Therefore, it is now time to engage in honest dialogue with different societal stakeholders. For this, we as scientists from different research disciplines and academic fields are responsible for providing the scientific foundations for the communication with the society, based on honest bioeconomy narratives, which will not deny the changes in life style we all will have to make.
- We think it to be unrealistic to define in concrete terms a global bioeconomy strategy. We have learned to appreciate the value of tailored approaches, with a focus on regional perspectives and necessities. Besides, it appears mandatory to honestly account for the current socio-political scenario in the respective target country or region. To illustrate our insight gained from exchange between our different home countries, we offer a few examples (*section 4 - Lessons learned from individual countries and Annexes*).
- From our in-depth analysis of various national bioeconomy strategies, we have developed the following core messages to political decision makers. However, they may also provide orientation for other stakeholders:
 - **Climate change provokes a sense of urgency – start sustainable bioeconomy NOW, merging regional perspectives with international collaboration;**
 - **Leverage increased efficiency of bioeconomy & bio-inspired processes – get more from less;**
 - **Invest in education – empower the bioeconomy drivers of today and tomorrow;**

- **Develop bioeconomy narratives – persuade the public, be honest and ethically sound;**
- **Develop bioeconomy “show cases” – such as lifting rural areas from poverty;**
- **Rewire current politics and rules for the economy – do not shy away from consequences;**
- **Match sustainability with the economy – but be prepared for pragmatic compromise;**
- **Be persistent and go for long-term policy perspectives – but start to pick opportunities NOW!**

Background and motivation of the authors - trustworthy young academics from different world regions – In 2014, the State of Baden-Württemberg has launched a comprehensive system-orientated research program on bioeconomy, focusing on regional research strengths. This research consortium – coordinated by the University of Hohenheim - was further supported and integrated by a state-wide graduate program, BBW ForWerts (*Bioökonomie Baden-Württemberg – Erforschung innovativer Wertschöpfungsketten*), coordinated by Heidelberg University. The goal of BBW ForWerts was to bridge between about 40 PhD students from different BW research institutions and research disciplines, launching a continuous interdisciplinary dialogue about risks and opportunities of bioeconomy as societal transformation.

Already in 2015, the first step of internationalization was initiated via collaboration with the China Scholarship Council: Thus more than 10 Chinese PhD students could be integrated into the graduate program. With the yearly BBW ForWerts Summer Schools, internationalization of the BBW ForWerts gained additional momentum by intensified exchange and communication with PhD students from Latin America (Brazil, Colombia).

In 2018, following the Global Bioeconomy Summit 2018, the BBW ForWerts graduate program organized its yearly summer school under the topic **Visions in Bioeconomy – Bioeconomy Strategies: Learning from the best?** From July 31st to August 3rd, 25 PhD students from diverse research disciplines and different countries (Brazil, China, Colombia, Germany, and Sweden) critically discussed the various challenges encountered when contrasting national “glossy print” bioeconomy strategy brochures with on-site “real world” conditions in different countries or regions. Renowned specialists from the named countries were invited to provide country-specific background but also valuable personal insight.

The participants of this BBW ForWerts summer school have decided to issue a “White Paper” on the outcomes of their intense and controversial discussions, reflecting their specific mind set of optimism mixed with constructive criticism. While their conclusions are in agreement with a number of key issues and recommendations also raised in the ‘*Global Bioeconomy Summit Communiqué, 2018*¹, the specific perspectives of young researchers from several countries offer additional insight. In particular, often neglected specific societal restraints such as unstable political conditions, cases of the extreme wealth gap, lack of education, mode of national governance and national economy, regional differentiation within nations, deliberate outsourcing of non-sustainable production, etc. were identified as obstacles to concrete implementation steps.

The participants of the BBW ForWerts summer school share the **vision of bioeconomy as a societal transformation towards a sustainable economy**. However, this generation of young researchers is also fully aware of the challenges of climate change and is

knowledgeable about the potential contributions bioeconomy can offer. The topicality of the link between climate change and the need for a sustainable bioeconomy was emphasized by the report of Steffen et al. 2018 ('Trajectories of the earth system in the Anthropocene'. <http://www.pnas.org/content/115/33/8252>), which was published coincidentally during this year's summer school, conferring a strong sense of urgency.

The following BBW ForWerts **Position Paper on Challenges of Bioeconomy Implementation at Regional and Global Level** aims to make the voice of young researchers audible to various societal stakeholders, with a focus on decision makers in regional and national governments in their respective home countries.

¹http://gbs2018.com/fileadmin/gbs2018/Downloads/GBS_2018_Communique.pdf

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1. WHO ARE WE?

Today, we are young engaged scientists. During our PhD training in bioeconomy we not only develop into specialists in our individual discipline. Having received a high level of education we fully embrace the vision of a sustainable bioeconomy. We are exchanging our experiences, aspirations, but also frustrations with fellow PhD students from different parts of the world, including Brazil, Colombia, China, Sweden and Germany. Already now we are bioeconomy stakeholders as our research is based on public support and funding. Tomorrow, in the near future, we will be actors (change agents), in research institutes, in industry of different levels of public administration. In brief: while we are concerned and share a sense of responsibility we are enthusiastic ambassadors for a sustainable bioeconomy!

2. WHY ARE WE SPEAKING UP?

Our motivations are manifold: In countries with high political uncertainty (e.g. Brazil, Colombia) and/or dramatic wealth gaps (e.g. Brazil, Colombia but also China) we see sustainable bioeconomy as a new strategy to help lifting the poorer part of our populations out of poverty. This particularly holds for underdeveloped rural areas. Here a primary motivation is to improve their economic situation. Beyond that, we wish to promote serious and honest discussion between different stakeholders in our respective countries.

We are convinced that for implementing a sustainable bioeconomy it will be mandatory to improve and intensify intra-societal communication at all levels. While the media can play an essential role, at present they do not live up to our expectations. We feel that to convince different parts of society, we urgently need convincing narratives, based on solid scientific evidence and being adapted to diverse target groups. People have to be able to link bioeconomy transformation to their own life experience. In Western-style democracies a profound societal transformation requires people's consent, but even in One-Party systems (like in China) with strong top-down governance a sound and convincing bioeconomy narrative is important to motivate the population for the required changes.

In intense discourse, we have studied several national bioeconomy strategies. In general, we are not convinced that the presently available “glossy print” versions of national bioeconomy documents can fulfill these communication criteria. They all suffer to different degrees from serious flaws. In particular, they:

- praise an idealistic bioeconomy future;
- offer limited concreteness for implementation;
- provide few links between the general bioeconomy strategy and the needs of the individual;
- start from idealized societal boundary conditions, not accounting for “real world” conditions, i.e. they focus almost exclusively on the technical challenges but reflect too little on legal and/or political restraints;
- do not challenge today’s economic system which is largely built on short-term profits and shareholder value instead of offer proposals regarding how to develop long-term policy perspectives.

In summary, we feel that most of these strategies turn a blind eye to socio-economic constraints. Therefore, it is now time to engage in honest dialogue with different societal stakeholders. For this, we as scientists from different disciplines (ranging from life and natural sciences to social sciences and the humanities) are responsible for providing the scientific foundations for the communication with the society, based - as outlined above – on honest bioeconomy narratives, narratives which include the changes in life style we all have to make. Based on the challenges of climate change, but also on the catastrophic consequences of largely unequal distribution of wealth and resources worldwide, we feel a strong sense of urgency!

3. WHAT WE HAVE UNDERSTOOD: FOR BIOECONOMY THERE IS NO ONE-FITS-ALL

In intense in-depth discussions, we - as an international group of bioeconomy PhD students – have made the valuable experience that different countries with different political experience and societal boundaries will require different strategies. This does not only refer to the differences in available resources (e.g. available biodiversity, biomass, and land area; climate conditions; regional differences) but also relates to concrete socio-political and economic restraints.

We think it to be unrealistic if not idealistic to define in concrete terms a global bioeconomy strategy. While we may agree on the general definition of bioeconomy as given in the Communiqué of the ‘*Global Bioeconomy Summit 2018*’ (“*Bioeconomy is the production, utilization, and conservation of biological resources, including related knowledge, science, technology, and innovation, to provide information, products, processes, and services across all economic sectors aiming towards a sustainable economy*”), this definition is of limited value when steps towards concrete implementation have to be taken under entirely different boundary conditions.

Based on the exchange of our individual experiences, we have realized the value of tailored approaches, often with a focus on regional perspectives. Also, we feel it be important to honestly account for the current socio-political scenarios in the respective target country or region. Thus, a sense for compromise and a certain dosage of pragmatism are required when bioeconomy implementation steps are evaluated for their intrinsic values. While the sustainability criterion is generally taken as the “golden standard” for any process in

bioeconomy, its operationalization may meet many hurdles and remains a central challenge. Life cycle assessment (LCA) certainly is a valuable tool. However, we have observed various cases of the only apparent fulfillment of the sustainability claim, achieved via outsourcing certain processes beyond the national border.

4. LESSONS LEARNED FROM INDIVIDUAL COUNTRIES

To illustrate our insight gained from exchange between our different home countries, we offer just a few examples.

Brazil – In Brazil, there still is the need for a comprehensive national bioeconomy strategy. However, a dedicated strategy is in the planning stage, based on the United Nations 2030 agenda for sustainable development. Meanwhile, a number of bioeconomy-targeting initiatives have been launched such as a ‘National Action Plan in Science, Technology, and Innovation in Bioeconomy 2016-2022’. One major stumble stone is the inefficient bureaucracy and the lack of swift knowledge transfer. Thus more transparent communication and actions are urgently required. This includes swift market assess of bio-based products. In general, the Brazilian research landscape suffers from serious imbalances in specific areas. To overcome these hurdles, international collaboration should be fostered, synergies between industry, academia and government institutions should be better mobilized. Another important challenge is that valid bioeconomy indicators remain to be defined. Unfortunately, the present national political setting has resulted in severe cuts in funding of education, with a negative impact on the development of human resources.

Colombia - In Colombia, a major challenge certainly is the lack of awareness of political actors and decision makers. Due to its conflict-ridden political development during the past decades (and yet no certain future in sight), a general barrier to a more consistent development has been the discontinuity not only in central government but also in research administration. For bioeconomy activists, it appears mandatory not only to raise political and public awareness about the potential wealth and diversity in Colombia’s natural resources but also to mobilize human capital for sustainable growth. Lack or low level of education - in particular in rural areas - is a severe limitation for development. More recently, a so-called Green-Growth-Strategy has been developed with the aim to include it in the action plan of the recently elected new government. This urgency demonstrates the problem of inconsistent societal framing conditions, where the only chance is to profit from short windows of opportunity. Attempts are now underway to more efficiently target the private sector in each Colombia region, with the mid-term aim to improve lobbying towards government decision makers. For this, regional indicators need to be defined. Setting up a strategic fond for supporting not only research and development but also fostering training in entrepreneurship could inject the necessary activation energy.

China – While in its official documents China does not yet propose a specified national bioeconomy strategy in its current 5-year-plan (2016-2020), this plan includes a large number of individual biotechnology-based initiatives, which can be seen as concrete implementation steps. A specific challenge for the Chinese society with its dramatic increase in the wealth gap between cities and rural areas is the economic development of poor rural communities. Here, bioeconomy could form a valuable science-based framework for local initiatives, providing on one side additional income while on the other side reducing the problem of left-behind children from parents having moved to the cities as migrant workers. The latter example is a strong illustration of direct links between bioeconomy and its

(potential) societal impact. With its one-party system, China could in a top-down decision decide to invest in these rural developments. While one focus would be renewable energy, a solid theoretical foundation for bioeconomy (theory-model-experimental research-implementation) has yet to be generated. Here, international communication and collaboration are regarded to be of high value.

Sweden - In Sweden, the focus of bioeconomy is largely centered on wood. While the large forest areas certainly constitute a valuable biomass for diversified use, the entire bioeconomy strategy is still largely unidirectional. Thus, biorefineries should be further developed to exploit the full potential of waste and side streams of forestry. Such a broadening of the national strategy would profit from an integrated system-level approach. Broader investment in all aspects of value chains and rearranging institutional collaborations were identified as future challenges. Last but not least, bioeconomy actors should be held accountable for their ecological footprints: Developed countries like Sweden should not get away with embellished versions of apparent sustainability!

Germany – While Germany has developed a comprehensive national bioeconomy strategy, the official document (National Policy Strategy on Bioeconomy 2030) could certainly be more specific and explicit. Assigning stakeholder responsibility, setting defined milestones and improving communication remain challenges for the future. Expertise is still largely fragmented and in the general public bioeconomy receives low visibility. There is an urgent need for regional (and/or topic-based) clustering. While the outlined bioeconomy perspectives are certainly broad and even inspiring, many of these visions still wait to be turned into concrete research and development projects. Thus defined milestones should be agreed on to allow monitoring of success. Clearly, Germany should have the strength and courage to invest more into the international collaboration. Based on its limited resources in biodiversity, biomass, and available land, Germany should profit from its strong and diversified technology and engineering expertise, which could be made profitable in the international exchange. Development of artificial photosynthesis, exploiting bacterial genomes for material transformations, merging bioeconomy with digitization, but also with research for human health could be promising research areas for a high-tech nation like Germany. With respect to communication, convincing “show cases” of implemented bioeconomy should be developed to leverage public support for bioeconomy.

5. CONCLUSIONS: FROM LESSONS LEARNED TO CORE MESSAGES

The following core messages were jointly developed by all BBW ForWerts summer school participants. They are meant to be a wake-up call for all bioeconomy stakeholders but specifically focus on political decision makers. To specify for individual countries, the summer school participants have identified fictitious “**personas**” thought to reflect the characteristics of the respective target group.

- a. **A sense of urgency** - Global population growth, limitation of global resources and acceleration of climate change call for immediate action plans: A sense of immediate urgency has to be evoked in the entire population. Otherwise, today’s children are likely to witness “hothouse earth” with all its consequences!
- b. **Get more from less** - Sustainable bioeconomy is about the sensible and knowledgeable use of all sorts of bioresources, the goal is to produce more with less.

However, scientific honesty let us predict that sustainable bioeconomy will also require profound changes in our consumption behavior.

- c. **Priority on education, education counts** - An important challenge for a successful societal transformation towards sustainable bioeconomy will be not only to better mobilize biodiversity and biomass resources and taking care of the worldwide soil and water qualities but also to strongly invest in human capital and resources via education.
- d. **Urgent search for honest bioeconomy narratives** - Concomitantly, communication at all societal levels has to be mobilized, merging scientific expertise with the capacity for deliberate but justified simplification in order to develop convincing bioeconomy narratives.
- e. **Rewiring politics and economy** - Sustainable bioeconomy requires long-term policy perspectives: The challenges resulting from the necessary rewiring of today's short-term/rapid return orientated political and economic systems have to be honestly and pitilessly addressed.
- f. **Develop show cases for the poor** - In countries with strong regional gradients in development and living standard (such as in under-developed rural areas) bioeconomy should be used as leverage to lift these populations out of poverty: Convincing "show cases" in such areas will give credit to the bioeconomy transformation!
- g. **Match sustainability with economy** - Wherever possible indicators for sustainability AND economic growth should be developed side-by-side.
- h. **Be persistent, think long-term, but pick opportunities now** - Be more specific and persistent in planning, milestones and, monitoring. Bioeconomy transformation is a long-term process. Encourage the future generation to proactively engage in the challenge of bioeconomy transformation: It may turn out to be their last life-belt!

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