



Bioeconomy
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LODZ DECLARATION OF BIOREGIONS

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GLOBAL BIOECONOMY STEMS FROM DEVELOPMENT OF BIOREGIONS AND LOCAL SUSTAINABLE BIOCOMMUNITIES

Declaration concluded by Central and Eastern European Regions and stakeholders from companies, academia, NGOs and farmers at the European Bioeconomy Congress Lodz 2016. The Declaration also brings into consideration the most important conclusions taken at the Global Bioeconomy Summit in Berlin and the Stakeholders 'Manifesto for the Bioeconomy in Europe' prepared in Utrecht. The Declaration will be presented at the Bratislava Bioeconomy Conference BBEC2016 and the European Innovation Summit 2016 to contribute to the discussion on the revision of the European Bioeconomy Strategy. The Declaration is a strategic document for developments of the Central and Eastern European Bioregions Forum.

Bioeconomy and Biocommunities

The increasing world population and the way we produce and consume manufactured goods place unprecedented pressure on our environment. Mankind is facing serious challenges related to climate change, demographic explosion, shrinkage of raw materials, shortages of water, increasing pollution and the decline of biodiversity. A significant part of these challenges and problems can be solved or limited by application of sustainable bioeconomy principles.

The bioeconomy is as old as mankind. For thousands of years we have used renewable biological resources (biomass) for eating, building and warming our houses, producing clothes and providing energy. The modern bioeconomy comprises those parts of the economy that use biomass from land and sea – such as crops, forests, fish, animals and microorganisms, as well as biological residues and waste – to produce food, animal feed, materials, chemicals, fuels, and energy in a sustainable way. Here, innovation and sustainability can reinforce each other.

The modern bioeconomy opens new industrial sectors and transforms the existing ones. The bioeconomy includes potentially unique features and advantages, like carbon neutrality, renewability, circularity and multi-functionality. A bioeconomy has a potentially strong socio-economic impact, enabling jobs in rural areas and making industries more competitive. To achieve sustainability, biomass should be used in closed and open cycles to achieve circular bioeconomy processes which will minimize losses and waste over the production, distribution and consumption cycles. We should understand more the necessary conditions for our health, resulting from health of environment, health of plants and health of animals, and constituting the concept of one health.

The harmonisation of human needs with the biosphere potential is the primary challenge for a sustainable future of the global ecosystems and society. The Lodz Declaration of Bioregions promotes the concept of developments of bioeconomy in local Biocommunities (biovillages, biocities, bioregions). Only such sustainable, circular biocommunities of well-educated local societies living in health in a healthy environment, with greening industries offering good jobs, may become the foundation for development of the global bioeconomy. How and in what timeframe this can be implemented, in the most efficient and sustainable way for all, is the real challenge.

A Biocommunity should be organised at a dedicated geographical region (subregion, village, district). A model Biocommunity should follow the principles of sustainable management and integration of water, biodiversity, services (agriculture, energy), ecosystem resilience and cultural heritage as well as greening industry and circular economy. It should carry out the following actions:

- to organise closed loops of cascading forest and agriculture biomass use, from land and sea
- to promote ecological agriculture resulting in production of high quality food
- to introduce a sustainable system of renewable energy including biorefineries and distributed prosumer energy aimed at achieving zero-energy level and low emissions of CO₂
- to introduce new tools for water resources and environment resources management
- to organise for greening industry new business value chains and systems around them based upon local bioresources
- to organise the ecoeducation system and training of stakeholders and to promote ideas of sustainable bioeconomy
- to involve cities and other local communities and their citizens in the greening process by promotion of energy-efficient buildings and electric transport

Sustainable and Circular Bioregions in Central and Eastern Europe

The bio-based economy is becoming reality in many regions in Central and Eastern Europe. The majority of them have selected bioeconomy as a smart specialisation strategy (RIS3). They have high but still underexploited potential and common problems and challenges in the area of bioeconomy. Therefore, Regions should play a crucial role in the successful development of bioeconomy potential; increasing R&D and technology capacities; deployment of local Biocommunities organized on the base of local sustainable circular bioeconomy value chains and provided with training and education measures aimed at the promotion of sustainable bioeconomy ideas.

Significant parts of the Cohesion Policy and Common Agriculture Policy are related to developments of bioeconomy. The Central and Eastern European Regions are responsible for implementation of a considerable amount of ESIF structural funds, reaching 20 billion euro assigned through smart specialisations to developments in bioeconomy. Most of these investments are done in local Biocommunities i.e. local rural communities and biovillages, including cities. Knowing the socioeconomic situation, needs of citizens and local challenges, the Regions may optimise the intervention of ESIF funds. There is a high need for creating synergies between available financial instruments as well as integration of efforts of Regions and stakeholders from industry, R&D institutions, farmers, financial institutions and society to create new opportunities and jobs for green industry, farming, forestry and aquaculture. They should jointly define strategies and action plans as well as develop tools aimed at unlocking investments in bioeconomy sector and to **transform regions into sustainable and circular Bioregions.**

Central and Eastern Europe has a chance to carry on balanced transition from agro-rural to modern industries, revitalising at the same time its rural areas and maintaining production of high quality food. Sustainable bioeconomy may be a solution for achieving a balance between cohesion and competitiveness. Having access to significant biomass resources, the greening industry providing bio-based and eco-friendly materials and products, with new functions of longer life, non-toxicity and recyclability, may become a significant part of Central and Eastern European economies. To efficiently develop bioeconomy, the analysis of existing potential should be performed as soon as possible, including mapping of available biomass resources and analysis of current and prospective value chains.

The considerable role in this transition process should play new technologies and innovations. Traditional sectors of agriculture, rural development, or construction should be strengthened by recent research achievements and technology transfer. New smart specialisations and new technologies should be developed to boost the greening industry. A key position in these developments should play the Framework Programme Horizon 2020. A specific strategy should be developed to increase participation of Central and Eastern European stakeholders and to assure a direct impact on developments of competitive bioeconomy in this macroregion.

Developing Local Bioeconomies

There is not a single global bioeconomy. It is local by its nature. To achieve global sustainability, bioeconomy has to be developed locally, i.e. at villages, cities and regions. Converting them into biovillages, biocities and bioregions, with new business models for circular bioeconomy, conservation and sustainable management schemes of vital natural resources as well as with integrated approaches to land, water, food and energy, will result in development of grids and networks of Biocommunities constituting the real foundation for the global bioeconomy.

Developments of local bioeconomies will contribute to achieving the UN Sustainable Development Goals in the area of food security and nutrition, healthy lives, water and sanitation, affordable and clean energy, sustainable consumption and production, climate change, marine and terrestrial ecosystems, land degradation, and biodiversity. In developing local bioeconomies, the following principles should be observed:

1. The harmonisation of human needs with the biosphere potential and its vital resources – fertile soils, clean water, clean air and biodiversity – should be achieved. A fundamental principle is ensuring the sound use of land by promoting integrated multidisciplinary approach known as **WBSRC**, which means the integration of Water and Biodiversity management, Services (agriculture, land, soil), ecosystem Resilience and Cultural heritage actions.
2. Humans should be considered as a part of the development of bioeconomy. We should incorporate a concept of “One Health”, being an interdisciplinary approach to all aspects of health care for humans, animals and the environment. The One Health principle links health of soil, health of plants, health of animals, and health of people. The synergies achieved will advance health care for the 21st century and beyond by accelerating biomedical research discoveries, enhancing public health efficacy, expeditiously expanding the scientific knowledge base and improving medical education and clinical care.
3. In developments of bioeconomy, food security is a fundamental priority. A sustainable environment with natural soil fertility and modern agriculture technologies including ecological agriculture should result in the production of high quality food. Such food, with new dietary patterns based upon nutrigenomics, is a basic requisite for an active and healthy life.

4. The greening industry, more resource efficient, with bioproducts, biofuels and supported by significant innovation, is a key factor in a switch to the sustainable bioeconomy. The EU market for green technologies is currently estimated at €2 trillion a year and employs more than 22 million people, 9% of total employment in the EU. It includes agriculture, forestry, fisheries, food and pulp and paper production, as well as parts of chemical, biotechnological and energy oriented industries, including branches like textile, construction, mining, cosmetics, daily care and nutrition.

The process of greening the industry by replacing fossil-based by bio-based products, developing biodegradable materials, introducing ecofriendly products with new functions such as longer life, stronger endurance, higher stability and less toxicity, as well as using biomass for energy production, exploiting waste and residues in a circular way, has enormous potential for growth with new jobs. To introduce more sustainable production and consumption patterns, life cycle assessment should be used which analyses the environmental impact of production, distribution and consumption from cradle to grave i.e. recycling or waste disposal. It is a grand challenge for new Science and Research to develop evidence-based new technologies and indicators to measure these impacts and potentials and thereby make them more visible for stakeholders.

5. The concept of circular bioeconomy is key in our efforts to cope with climate change and the depletion of natural resources. Growth should be decoupled from increasing consumption of resources and circular bioeconomy should be a smart way to cut costs and improve competitiveness. New value chains aimed at closing cycles and achieving circularity should be developed.

6. There will be no sustainable bioeconomy and no progress in achieving bioeconomy goals without the direct involvement of civil society. Transformation of local resources into bioenergy needs the direct involvement of prosumers: i.e. small green energy producers and energy consumers. Village/community inhabitants may decide collectively on the restructuring of their energy supply and participate in the planning and management of the energy production process.

The social community must be educated on problems related to sustainability, on such issues as energy efficiency, energy savings, decreasing usage of environment (water, food, wastes) as well as diet, nutrition and health. Targeted awareness campaigns to enhance market uptake of sustainable bio-based products should be organised. Personnel training in schools and universities and skill-development in all involved trades and associated companies will generate a high level of know-how and new market opportunities. Difficulties of market acceptance and higher prices of bio-based products, as compared with the relevant fossil-based counterparts, which still hinder a wide diffusion of these products, should be adequately tackled. To build up dialogue with civil

society, to achieve bioeconomy based on a widely shared vision of a sustainable future, innovative ways of communication with the public must be identified and developed, taking due account of their immense complexities for understanding and communication.

Way forward

Stakeholders from Regions, industry, academia, farmers and NGO have discussed in Lodz possible actions aimed at development of bioeconomy and are proposing the following **KEY ACTIONS**:

1. Deployment of local Biocommunities - elements for local, regional and national strategies and action plans

Global problems such as limiting GHG emissions and reducing their impact on the environment, protecting the climate and promoting healthy life, and the use of alternative energies can be dealt with effectively on the local level. Regions could play a key role here. Regions equipped with structural and innovation funds (ESIF) may organise and support local sustainable Biocommunities (biovillages, biocities) implementing a series of measures for achieving sustainable bio-based growth, reduced impact on environment, local renewable energy supply and integration of agriculture, ecology and life in rural areas and also with a view to growing urban agglomerations. A wide multidisciplinary and integrated approach, including the following items, is necessary:

- **Water** integrating hydrotechnical and ecological water resources management;
- **Biodiversity**;
- **Ecological agriculture** strengthened by recent achievement of science in the areas such as biotechnology, microbiology, genetics and agrophysics;
- **Sustainable energy areas** with the zero-energy status;
- **Small agro-biorefineries** oriented on the production of small volumes of high value chemicals associated to high volumes of fuels or lower value products;
- **Forest and soil CO₂ sequestration** by additional forests or plant plantations;
- **Ecosystem resilience**;
- **Cultural heritage** contributing to optimization of the social life;
- **New value chains** optimising the biomass circulation;
- **Biocities** with energy efficient buildings, renewable energy and green transport.

More details concerning ideas for deployment of Biocommunities are included in Annex 1

2. Networking of Regions

For bioeconomy to become a key driving force of our social and economic development, a more systematic, inter-sectoral, inter-regional and international approach is necessary. It is important to ensure that the knowledge generated across the Union is continually improved and transferred. Regions may play a key role in sharing experiences and best practices by taking the lead in the following actions:

- to network and integrate bioeconomy stakeholders from regional authorities, industry, R&D institutions, farmers, financial institutions and society;
- to define joint strategies, action plans, initiatives and projects as well as to develop tools aimed at unlocking investments in the bioeconomy sector;
- to create synergies between instruments available at European, national and regional level aimed at the development of bioeconomy, the development of new technologies and value chains and the support of long-term international research on biobased technologies, processes and products in selected innovation areas;
- in cooperation with more advanced Regions, to assure transfer of best practices, sharing knowledge, mutual learning, training and education;
- to promote ideas of sustainable bioeconomy, increase awareness of civil society and create and facilitate the growth of markets for biobased products;
- to initiate joint regional and inter-regional projects with strategic relevance to the development of bioeconomy sectors;
- to exchange experiences with regulatory frameworks for harmonisation of regulations, introduction of new standards, certificates, and labels;
- to initiate and perform joint research and development projects to develop new technologies and services for Biocommunities.

In Lodz, the Central and Eastern European Bioregions Forum is established as a macroregional initiative, integrating stakeholders, supporting development of smart specialisations of Regions in bioeconomy, enhancing knowledge, harmonising and achieving synergy in the use of ESIF and other funds. The initiative is open for collaboration with other European regions, especially in sharing experiences, transfer of knowledge and technologies as well as mutual education. Using available money from ESIF or H2020 funds a vivid platform will be developed for cross-border and interregional meetings, sharing knowledge and experiences, transferring knowledge, broadening it to best practices and developing databanks for local and regional success stories.

3. Research, Education and Training

The development of Bioeconomy, aimed at reduction of the dependence on natural (in particular, fossil) resources, transformation of manufacturing, promotion of sustainable production based upon renewable resources from land, fisheries and aquaculture and their conversion into food, feed, fibre, bio-based products and bio-energy, cannot be achieved without heavy and integrated research efforts. Development of interdependent and complex value chains across a wide range of products and sectors calls for a coherent and coordinated EU approach. The main efforts are streamlined by the Framework Programme Horizon 2020. It helps to set Europe on a solid basis to sustain food security, the natural resource base and sustainable growth path, adapting and innovating to find resilient and efficient alternatives to our fossil-based economy. It tests, demonstrates and transfers effective solutions to major challenges affecting the Bioeconomy on land and sea, across the agri-food chain from soil to society.

The strong and geographically widespread research network should be built on existing EU strengths and resources, embracing technological and scientific excellence and creating new and novel partnerships between research units and industries, taking advantage of new potential in the biological, ecological, technical and information technology domains.

There will be no sustainable bioeconomy without direct involvement of civil society and societal appraisal of bioeconomy. The awareness of citizens must be built and new transdisciplinary skills and competences are necessary, specifically with regard to successful new business models, suitable policy practices, new life styles and sustainability standards.

We cannot afford life styles which are not sustainable in terms of overconsumption of energy, food, water and increased impact of environment. The social community must be educated on problems related to sustainability, on such issues as energy efficiency, energy savings, decreasing usage of environment (water, food, wastes) as well as nutrition and health.

New life styles are required, taking into account new patterns of nutrition, diet and consumer behaviour and presenting a interdisciplinary approach to all aspects of health care for humans, animals and the environment by the One Health principle linking health of soil, health of plants, health of animals, and health of people. Improved medical education and clinical care, expansion of the scientific knowledge base and increased awareness of citizens will have direct impacts on our health.

New concepts of prosumer (producer + consumer) energy systems, where citizens are introduced into energy production and consumption processes, will open new areas of social-economic activity and offer new jobs .

Civil society should be well educated and engaged in dialogue to achieve bioeconomy based on a widely shared vision of a sustainable future. Innovative ways of communication with the public must be identified and developed. This starts with promotion, access to existing knowledge and transfer of knowledge and mutual learning. A strong interconnection among education providers, producers, workers, citizens, researchers and innovators should be supported and facilitated. Universities should consider initiating interdisciplinary study programmes oriented on bioeconomy with Master of Bioeconomy graduates. To achieve a significant growth in greening industry, a specialised work force and craft skilled people must be educated and trained. This involves exploring new ways of communication and cooperation with local and regional chambers of industries, commerce and vocational training, supported by relevant national legislative efforts where appropriate.

4. Cohesion Policy

Bioregions

Regional policy is vital for mobilising the potential of EU regions and cities to decouple growth from resource overuse, reduce impact on environment, introduce circular processes at regional level and stimulate the growth of green industry. Bioregions should reflect their entering the bioeconomy development path and promoting the measures needed to deliver green change in their regional smart specialisation strategies (RIS3) or other growth agendas and regional strategies.

Synergy between ESIF and other instruments

It is important to know that a significant part of the present structural funds (European Structural and Investment Funds - ESIF) is allocated in the areas belonging to bioeconomy. This is also confirmed by a majority of Regions selecting elements of bioeconomy such as food, agriculture, green energy, or ecology as their smart specialisations.

There is an objective to harmonise the implementation of EU and national policies related to developments of bioeconomy, involving Regions responsible for ESIF funds. It is important to achieve synergy between different available instruments: ESIF, Common Agriculture Policy, Framework Programme Horizon 2020 and national funding. To avoid duplication as well as to optimize interventions and to make them more effective, efficient and inexpensive, the exchange of knowledge, joint strategy developments, integration of strategies, harmonization of action plans, joint large initiatives, mutual learning and training should be developed.

Future Cohesion Policy 2020+

Recently, the European Commissioner for Regional Policy, Corina Crețu, has opened the debate on the post-2020 cohesion policy reform. It is important for bioregions to be active in this process. We could consider if the development of bioeconomy, especially local biocommunities integrating many aspects of bioeconomy at local level, may be a major instrument for lagging behind regions, especially those which, in spite of decades of EU support, have not converged towards the EU average. The new Cohesion Policy combined with Common Agriculture Policy could also better support economic growth of rural areas by development of sustainable biocommunities with high quality and ecofood production, energy security and local bioeconomy value chains; it could also stimulate similar developments in larger urban agglomerations.

A new Cohesion Policy oriented to bioeconomy developments could be beneficial to all EU regions since it requires a transfer of knowledge, technologies and best practices from more to less advanced regions. To build a common framework for exchanging experience and knowledge across the EU, the measures for a twinning or networking of regions as well as knowledge exchange platforms could be proposed as elements of a future Cohesion Policy for Europe.

This document is meant to start triggering such a discussion as well as deepening the discussions on elaborating local, regional or national strategies to develop respective bioeconomies in Central and Eastern Europe with its undeniable large reservoir on biomass and new knowledge. To make this process sustainable and long enduring and also to assure future collaboration on these topics, the creation of a permanent Central and Eastern European Bioregions Forum is proposed.

Conclusions

The Lodz Declaration of Bioregions contributes to the ongoing discussion on revision of the Bioeconomy Strategy for Europe and on how and by whom Bioeconomy strategies are needed and should be worked out. The Declaration brings into consideration new ideas:

- the global sustainable bioeconomy must be first developed at local sustainable circular Biocommunities with a panoply of new or additional elements, ranging from local value chains, local green energy, ecology with resilience and biodiversity, water management to cultural heritage;
- the new Cohesion Policies for Europe should consider development of Biocommunities and Bioregions as a key element for revitalization of rural areas, improvements in ecology, mitigation of climate change and development of local circular bioeconomies;
- Regions of Central and Eastern Europe, as responsible for implementation of significant parts of ESIF funds focused through RIS3 specialisations on bioeconomy, should actively look for synergies with other European instruments and create opportunities for multilateral cooperation, joint initiatives and projects. The Central and Eastern European Forum of Bioregions, as well as other networking initiatives, should contribute to achieving these goals.
- There will be no sustainable bioeconomy without direct involvement of civil society and societal appraisal of bioeconomy. The proper awareness, education and training schemes should be developed.

The Declaration also offers new proposals for concrete actions aimed at the realisation of the above ideas.

Annex 1.

Ideas for development of local Biocommunities

Local sustainable Biocommunities (biovillages, biocities) should develop new business models for circular bioeconomy as well as measures for achieving sustainable bio-based growth, reduced impact on environment, growth of local renewable energy supply, conservation and sustainable management schemes of vital natural resources as well as integrated approaches to land, water, food and energy. The full harmonisation of human needs with the biosphere potential and with economic and social development can be achieved through an integrated implementation of the following measures:

Water

A new multidisciplinary ecohydrology paradigm should be developed integrating hydrotechnical and ecological water resources management approaches. It should enhance the ecosystem carrying capacity (water, biodiversity, resilience, ecosystem services for society) and harmonisation of environmental potential with societal needs by using ecosystem processes as management tools. Water is the primary factor limiting and regulating the ability of ecosystems to accumulate carbon, nitrogen and phosphorus, hereby becoming an important hitherto underestimated factor fostering or hampering the development of bioeconomies.

Climate change and the current overexploitation of environment call for new approaches and the application of ecohydrology to create adequate abiotic conditions, e.g. water content in soil and groundwater level for creating biologically productive, diversified and resilient ecosystems/communities.

Biodiversity

Biocommunities should contribute to the maintenance and development of the multitude of different ecosystems in which species form unique communities, interacting within and between all species of plants, animals and micro-organisms as well as the air, water and soil. The potentials and multifunctionality of biodiversity on local levels should be more focussed in developing bioeconomies.

Ecological agriculture

Traditional agriculture which is still present in Central/Eastern Europe should be strengthened by recent achievements of science such as in biotechnology, microbiology, genetics and agrophysics to establish stable value chain cooperation and increase its efficiency. Within it, ecological farming should be developed since it has lower environmental impact and may contribute to globally sustainable land management systems, prevention of soil erosion, water infiltration and retention, carbon sequestration in the form of humus, and increased biodiversity. Many agrotechniques such as crop rotation, creating stocks and buffers, introduction of symbiotic species, application of mulches, bio-stimulants and fungal bacterial formulations may be used to improve soil physical parameters and to promote the availability of nutrients in the rhizosphere and their subsequent uptake and acquisition by plants, enhancing their growth and yield.

Sustainable energy

Agriculture and rural areas must contribute to production of energy. The Biocommunity should aim at reaching the zero-energy status (self-sustainability), i.e. energy and biofuels from biomass and other renewables (PV, wind, solar) should be sufficient for needs of citizens, public institutions and local companies. Key elements of biocommunity are agro-biorefineries and a distributed prosumer energy system for electricity, biogas and district heating linked by smart grids. The biocommunity should tend to be self-powered and independent from external grids, despite being connected to national grids for feeding surplus energy.

Small agro-biorefineries

A small farming system in Eastern and other parts of Europe requires development of small agro-biorefineries. To improve their economics, they should be oriented on production of small volumes of high value chemicals associated to high volumes of fuels or lower value products. The value chain concept needs to be fully applied, to clarify and secure critical issues such as biomass supply and output applications (including market for final products).

The agro-biorefinery should be based upon available local streams of biomass including agrowastes (manure, crops, wastes from agroindustry), forestry waste and special energy plants. The consumers, household and municipal waste as well as industrial wastes should be included into processes as well. Local supply chain should minimize costs for recycling and transport.

The plant should utilize biological, thermal or thermochemical processes to produce power, heat, cool and biofuels. Prior to conversion to energy, separation and pre-processing with an extraction of high value products from plant or agroindustry biomass should be performed. In this way the

essential or vegetable oils as well as sugars, fat and proteins may be extracted. Materials such as cellulose, hemicellulose and fibres can be produced. Next, small-scale units producing ethanol or starch should be considered. Fermentation of fresh liquid manure and other agrowastes for production of biogas should be a major process. Biogas residues may be used as biofertilizers, decreasing the demand for mineral fertilizers. Energy needed for the processes can be generated from biogas or combined heat and power (CHP) units.

Forest and soil CO₂ sequestration

Additional forests or plant plantations may absorb large amounts of CO₂, producing at the same time high volumes of biomass for heating or power generation. Such energy plantations, combined with adequate forest management practices and regulatory nature protection measures, may considerably contribute to climate change mitigation. Energy forest plantations should not compete with food crops for highly productive land as they can be grown on slopes, marginal, or degraded land. There may be introduced special plantations (respecting local biodiversity, avoiding risk of introducing invasive species) which will aim at enriching the soil, developing humus and depositing large amounts of carbon as organic matter.

Ecosystem resilience

Climate change and human activity including agriculture, deforestation, pollution, mining, recreation, overfishing and dumping of waste have significant impacts on the environment. Biocommunities should aim, through greater understanding and increased awareness of ecosystem resilience, at sustainable use of environmental goods and services. They should consider resilience of the ecosystem and its limits related to the water cycle, fertility, biodiversity, plant diversity and complicated human activity impacts. An integrated approach to sustainable agriculture, forestry, energy production should have a positive impact on the environment.

Cultural heritage

Biocommunities contributing to a healthier environment for all living organisms, mankind, flora and fauna should also optimize the social life. One of the key elements of developing societies could be the maintenance and promotion of cultural heritage. Integrating social and cultural enhancements may lead to a more promising future and reaching common goals based on sustainability ideas. These aspects, risks and potentials have not yet been fully explored in current Bioeconomy strategies and discussions.

New value chains

The deployment of biocommunities needs the development of new value chains. An integrated management of environment should be applied, optimising the ecosystem processes, enhancing the ecosystem carrying capacity (water, biodiversity, resilience, ecosystem services for society), and harmonising environmental potential with societal needs and biomass production.

Local biocommunities should develop and optimise the biomass circulation by the introduction of cascade use, closed loops and optimisation in terms of getting new, innovative and/or better a high-end products. They should look for new sources of raw materials with multisectoral applications. In this context, the potential of integrating knowledge on biological resources (biotechnologies and life sciences) with new knowledge created by converging technologies, in particular digitilisation, big data, cloud computing, added manufacturing etc. should be examined, looking also at local and regional industries and attracting investment opportunities.

Biocities

Today, more than half of the world's population lives in cities and the cities often struggle to cope with environmental, social and economic problems resulting from pressures like pollution, traffic, social inequity and over-crowding. Cities have to accelerate the transition to their cleaner, healthier, and more economically viable future through improvements in efficiency by new spatial urban planning, investments in energy efficient buildings, renewable energy, and green transport including trams, electric cars and buses.

According to European Commission estimates, buildings are currently responsible for 40 % of the EU's energy consumption and 36 % of its CO₂ emissions. To meet the EU's ambitious energy efficiency and CO₂ emissions targets, zero-energy constructions have to be widely introduced. To reduce its carbon footprint, innovative new building materials with minimised 'embodied energy', new insulation and glazing materials, smart windows and new energy-efficient technologies must be adopted. Cities should take the lead in retrofitting and renovation of buildings and whole municipal districts.

Cities may help to decarbonise the European economy by the introduction of electric vehicles which may cut emissions, stabilize the energy systems and improve quality of life and work of citizens. There are new processes required for waste separation, recycling as well as more ecofriendly and resources efficient products. We will be successful if the citizens are included into the greening strategies and well educated how to use resources sparingly and to reduce consumption of energy and goods. As mentioned above, an alliance with the digital communities

as well as new trends in e-mobility should be established, exploiting full local and regional circumstances in industry, education, training and skills

Social aspects

The deployment of biocommunity processes and investments should generate new jobs. They can be generated in ecological agriculture, biomass management, biorefinery operation and maintenance, ecosystem management as well as in the engineering and construction sectors during all phases of the planning and installing prosumer energy units or building. Focusing on ecological aspects requires a better understanding of global problems and challenges and gives rise to a stronger demand for training, education and enhancing of social skills.