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Regional stakeholder report

Baden-Württemberg



BIOPRO, CABW, ISC
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1. Abstract

Even though it is widely known for this, however, Baden-Württemberg is not only characterized by its industrial strength. The state is characterized by low unemployment and a comparatively young population. Apart from that, the state has a significant agricultural and forestry sector, as well as a large number of educational and research institutions to scientifically investigate issues of the bioeconomy. This profile creates good conditions to implement bioeconomy regionally. Also, in rural areas, which are characterized by a high quality of life and which can be seen as a backbone of Baden-Württemberg. The bioeconomy is underpinned by a regional bioeconomy strategy, which is already being implemented since 2019. Topics such as biodiversity and environmental protection are supported by funding measures and regulations. In terms of stakeholder groups, the broad cluster landscape, a large number of SMEs and the networking of citizens' initiatives with regional and local administration represents a good starting point for the implementation of GoDanuBio and can serve as a source of inspiration. In this report, the state of Baden-Württemberg will be characterized through a PESTEL analysis in relation to the circular bioeconomy. Furthermore, important stakeholder groups will be identified and their position in the network will be presented.

2. Definitions

2.1. Circular Bioeconomy

The definition of bioeconomy is anchored in the state strategy "The Baden-Württembergs government's sustainable bioeconomy strategy" (2019) from the Ministry of Rural Affairs and Consumer Protection and the Ministry of the Environment, Climate Protection and the Energy Sector. It is defined as an "economic system that provides products, processes and services in all economic sectors within the framework of a sustainable economic system through the knowledge-based production and use of biological resources, processes and principles"¹. 50 million euros are planned in the period 2020-2024 for the implementation of the state strategy². An example for the already ongoing implementation is a new research campus in a rural area, being built since April 2020 in the Swabian Alb to develop climate-friendly and sustainable materials from hardwood. An advisory board "sustainable bioeconomy" was introduced in summer 2020 to accompany the implementation and development of the bioeconomy strategy. A sustainable bioeconomy in rural areas has been promoted since 2020 with a special funding programme that emerges as direct measure from the strategy. The focus is on the efficient and

¹ https://um.baden-wuerttemberg.de/fileadmin/redaktion/m-um/intern/Dateien/documents/Bioeconomy_strategy.pdf, last accessed 26/01/2021

² <https://um.baden-wuerttemberg.de/de/service/presse/pressemitteilung/pid/landesstrategie-nachhaltige-biooekonomie-fuer-baden-wuerttemberg-vorgestellt-1/>, last accessed 27/01/2021

regional provision of raw materials, intelligent raw material management and the production of new materials³.

2.2. Contemporary processes

a) Demographic change

Since 1996, the number of German residents in Baden-Württemberg has increased by 4.0%, while the part of foreigners has risen by 17.7%. In rural areas, the number of Germans actually decreased⁴. The rate of immigration in Baden-Württemberg is so high that current population projections still expect the state's population to increase by up to 1.5 million by 2060⁵. Compared to 1995 until 2019, the number of inhabitants has risen almost steadily and in 2019 already amounts to more than 11,100,000 inhabitants⁶. With an average of 43.6 years, Baden-Württemberg has the youngest population behind the two city states of Hamburg (42.1) and Berlin (42.6). 19.4% of the population living in Baden-Württemberg is younger than 20 years, which is more than in any other federal state in Germany. In addition, the proportion of people older than 65 years is comparatively low (20.4%)⁷. The fact that Baden-Württemberg has one of the youngest populations in a comparison of the German states is primarily due to strong immigration at times. On average, the immigrants are significantly younger than the native population and have thus mitigated the aging of the population⁸. As a result, it can be assumed that the ageing process in Baden-Württemberg will slow down in the future⁹. Baden-Württemberg is the federal state with the 3rd smallest percentage of unemployed (4.1 %) and the 3rd highest employment rate. In the urban and its peripheral areas, population growth of 7.1% and 6.6%, respectively, was recorded between 1996 and 2016. In rural areas, this was only 2.8%. Especially in the smaller municipalities of less than 2000 inhabitants and in rural areas, trends of population decrease could be observed⁴. However, population growth in rural areas occurs in areas of rural university locations. In addition, an almost nationwide migration of families to rural areas can be observed, although this varies greatly from region to region. Due to the landscape and elderly care facilities, elderly people also migrate to areas such as the central Black Forest, Lake Constance and the Allgäu. It can be summarized that rural areas in Baden-Württemberg show remarkable demographic stability⁴.

³ <https://mlr.baden-wuerttemberg.de/de/unsere-themen/biooekonomie-und-innovation/biooekonomie/foerderprogramm/>, last accessed 27/01/2021

⁴ Entwicklung der Ländlichen Räume in Baden-Württemberg (IREUS/ILS, 2019)

⁵ <https://www.statistik-bw.de/Presse/Pressemitteilungen/20190>, last accessed 27/01/2021

⁶ Statistisches Bundesamt 2021, [ID 154878](#), last accessed 27/01/2021

⁷ Statistisches Bundesamt 2021, [ID 548415](#), <https://www.demografie-portal.de/DE/Politik/Baden-Wuerttemberg/Laendermonate/baden-wuerttemberg-demografisch.html>, last accessed 27/01/2021

⁸ <https://sozialministerium.baden-wuerttemberg.de/de/soziales/generationenbeziehungen/demografischer-wandel/>, last accessed 08/02/2021

⁹ <https://www.statistik-bw.de/Presse/Pressemitteilungen/2018100>, last accessed 27/01/2021

b) Rural development

In Baden-Württemberg, around 70% of the area is rural where 34% of the population lives and generates 30% of the country's economic revenues. In terms of economic efficiency, jobs and local services of general interest, rural areas in Baden-Württemberg are on equal footing with urban areas¹⁰. Many innovative small and medium-sized companies are at the forefront of the world league and offer attractive jobs and also a high commitment of the citizens in voluntary activities shape the rural area. In the joint cooperation of all specialised departments of the state government of Baden-Württemberg, the Cabinet Committee for Rural Areas specifically and effectively promotes the future viability of the rural areas. In this sense, the rural areas are the backbone¹¹ of Baden-Württemberg. They are characterized by a high quality of life and also score high in economic terms which keeps them strong and attractive. The Rural Development Program (ELR), a central instrument of Baden-Württemberg's structural policy, provides funding for projects that preserve vibrant town centers, enable contemporary living and housing, ensure local supply and create sustainable jobs. In 2020, the state supported more than 1,530 projects in 487 communities through ELR funding totaling around 90 million euros. In addition, there is funding for innovative companies based in rural areas. Since 2014, this funding guideline has supported an average of 18 potential global market leaders per year with around six million euros. A special focus is on future-oriented and innovative companies that promote innovations in the sense of a circular economy and in the field of bioeconomy¹². In addition, since 2021 there has been the funding program "BIPL BW" for the promotion of future investment projects in individual companies as part of the bioeconomy innovation and investment program for rural areas. Accordingly, companies along the agricultural and forestry value chain are to be supported in order to implement innovative approaches in the processing of bio-based resources¹³.

One may draw the focus on the traditionally given strength of the high diversity of regarded regions in Baden-Württemberg which may be agriculture, forestry, industrialization, handicrafts, tourism, and also just plain rural living which gives rise to an increased rate of commuting. People living in rural areas are aware to keep the already reached high environmental standards by local and interconnected community and neighborhood building without stepping back from customer and consumer focus. The increase of production in service, merchants, industrial products and energy supply goes in parallel with the awareness of the use of regenerative energy sources. Bioeconomy is a growing topic and a research focus in Baden-Württemberg also in urban areas. It combines agricultural science, natural sciences and economic and social sciences in a complex way.

¹⁰ <https://www.baden-wuerttemberg.de/de/bw-gestalten/nachhaltiges-baden-wuerttemberg/laendlicher-raum/>

¹¹ <https://mlr.baden-wuerttemberg.de/de/unsere-themen/laendlicher-raum/kabinettsausschuss-laendlicher-raum/>

¹² <https://mlr.baden-wuerttemberg.de/de/unsere-themen/laendlicher-raum/foerderung/efre/spitze-auf-dem-land/> , last accessed 16/03/2021

¹³ <https://mlr.baden-wuerttemberg.de/de/unser-service/presse-und-oeffentlichkeitsarbeit/pressemitteilung/pid/neues-biooekonomie-innovations-und-investitionsprogramm-35-mio-euro-aus-ruecklage-zukunftsland-bw/> , last accessed 22/03/2021

c) Rural-urban cooperation

Baden-Württemberg has a comparatively balanced economic structure between all areas, which contributes significantly to a high degree of social cohesion. Baden-Württemberg's rural areas have even been able to expand their contribution to economic growth and job security in recent years¹⁴ and can thus be considered well developed. Only in a few cases does it take more than 35 minutes to reach the next highway. With a few exceptions, the regional railway network can also be reached by car in less than 20 minutes.

The goal of a successful rural-urban interaction is cooperation between the various actors of these community areas and a territorial multi-level governance in order to establish and maintain a balance between them. At the moment, the lead is still too much on the side of the cities. In 2005, 45% of workers worked in their municipality of residence; in 2017, this number decreased to 41%¹⁵. The remaining share is workers that are commuting to their workplace, with 84% using cars to do so¹⁶ (since the figures are from 2016, there is no COVID-19 influence to note). In general, residents of rural areas have to spend more time on average to reach desired facilities, such as airports, train stations or universities¹⁷. Demographic change will make it necessary to find new mobility solutions in the future in order to maintain the quality of life of rural areas as residential locations. At the same time, these activities should comply with climate protection targets. For example, modes of transportation must be better networked and interdisciplinary approaches must be pursued. This can also be ensured by digitalization, in the form of car sharing and enforced e-mobility¹⁸.

In order to maintain and strengthen the competitiveness of rural areas, it may serve outsourcing parts of the bioeconomy value chains from urban to rural areas. This turns the industrial bioeconomy more into a rural bioeconomy. In this way, material flows between rural and urban areas are created, ideally as a circular flow. One example here is the "RUN" (Rural-urban nutrient partnership) research project¹⁹, in which a concept for the regional closed-loop recycling of biowaste and domestic wastewater is being developed and implemented as part of a pilot project. Several Baden-Württemberg partners are active in the project. Concepts like these go along with resulting service and administration flows between rural and urban areas. The competitiveness of rural areas can thus be increased by closing ranks and joining forces with the urban areas. Another example for strengthening rural-urban interaction is the competition "Regional Competitiveness through Innovation and Sustainability" (RegioWIN) of the Ministries of Finance and Economy, of Rural Areas and Consumer Protection and the Ministry of Science,

¹⁴ https://www.ireus.uni-stuttgart.de/forschung/forschungsprojekte/abgeschlossen/laendlicher_raum

¹⁵ <https://www.statistik-bw.de/Pendler/Ergebnisse/Pendleranteil.jsp>, last accessed 8/2/2021

¹⁶ <https://www.statistik-bw.de/Pendler/Ergebnisse/Verkehrsmittelwahl.jsp>, last accessed 8/2/2021

¹⁷ Entwicklung der Ländlichen Räume in Baden-Württemberg (IREUS/ILS, 2019)

¹⁸ <https://vm.baden-wuerttemberg.de/de/mobilitaet-verkehr/bus-und-bahn/mobilitaet-im-laendlichen-raum/>, last accessed 8/2/2021

¹⁹ <https://en.run-projekt.de>, last accessed 18/03/2021

Research and Arts. It was launched in February 2013 and is intended to contribute to improving regional location factors. One of the lighthouse projects developed in this context is the innovation campus "Inno-Camp" in Sigmaringen (since 2015). The aim of the project is to strengthen the innovative capacity of the regional economy, to attract and retain highly qualified specialists and to increase the attractiveness of the location for companies by developing a unique infrastructure²⁰. RegioWIN will be further developed (RegioWIN 2030) from 2021 to 2027 and adapted to new challenges together with the regional partners²¹.

3. Key determinants of the regional governance system

a) Political conditions

The Baden-Württembergs government's sustainable bioeconomy strategy (2019)	
Relation to demographic change	No, only indirectly
Relation to rural development	Creating attractive, environmentally friendly jobs and increasing value in rural areas is one of the four goals of the strategy. This is to be ensured through interdepartmental cooperation and the interdisciplinary involvement of stakeholders ²² .
Relation to circular bioeconomy	The state strategy aims to develop renewable or recyclable raw material sources using innovative biological concepts in order to reduce the use of fossil raw materials and the dependence on energy and raw material imports. It is intended to contribute to a reduction in greenhouse gas emissions in Baden-Württemberg, the conservation of natural resources and the preservation of biodiversity. With this strategy, Baden-Württemberg is to become an exemplary state for a transformation toward a sustainable and circular economy ²³ .
Implementation	With the strategy, Baden-Württemberg is pursuing four fundamental goals that are to be achieved with the help of 37 measures. Innovative biological concepts should be used to tap renewable or recyclable raw materials, reduce

²⁰ <https://innocamp-sigmaringen.de/konzept.html?language=de>, last accessed 22/03/2021

²¹ <https://2021-27.efre-bw.de/regiowin2030/>

²² <https://um.baden-wuerttemberg.de/de/service/presse/pressemitteilung/pid/landesstrategie-nachhaltige-biooekonomie-fuer-baden-wuerttemberg-vorgestellt-1/>, last accessed 16/03/2021

²³ <https://um.baden-wuerttemberg.de/de/service/presse/pressemitteilung/pid/landesstrategie-nachhaltige-biooekonomie-fuer-baden-wuerttemberg-vorgestellt-1/>, last accessed 16/03/2021

	greenhouse gas emissions and strengthen biodiversity. Baden-Württemberg is to become an exemplary state for a sustainable and cycle-oriented form of economy. The convening of a state bioeconomy advisory board, since summer 2020, is also intended to support this.
Territorial level	Regional
Interaction between levels	Funding programmes such as "Sustainable Bioeconomy as an Innovation Driver for Rural Areas" ²⁴ or the BIPL BW-Innovation funding line ²⁵ are intended to support the implementation of the strategy in form of technology and knowledge transfer in the field of sustainable production and use of resources from regional agriculture and forestry on local level. In the future, there should be supra-regional initiatives in the field of bioeconomy (on national and EU level).
Relation to S3	Within the strategy of intelligent specialisation (RIS3), the sustainable bioeconomy is included as a future field ²⁶ .

Innovation Strategy Baden-Württemberg (Update 2020)	
Relation to demographic change	Demographic change is seen as both challenge and opportunity. The opportunities lie in the fact that aging societies can also generate new business models as a result of changing needs - particularly in conjunction with the possibilities offered by digitalisation - and thus create space for innovations ²⁷ .
Relation to rural development	The innovative strength and importance of companies in rural areas is mentioned. Rural development can be promoted through support programs for them ²⁷ .

²⁴ <https://mlr.baden-wuerttemberg.de/de/unsere-themen/biooekonomie-und-innovation/biooekonomie/foerderprogramm/>, last accessed 19/01/2021

²⁵ https://mlr.baden-wuerttemberg.de/fileadmin/redaktion/m-mlr/intern/dateien/PDFs/Biooekonomie/Biooekonomie-02-2021-Bekanntmachung_BIPL_Innovation.pdf, last accessed 19/02/2021

²⁶ Baden-Württemberg Innovation Strategy (Update 2020)

²⁷ https://wm.baden-wuerttemberg.de/fileadmin/redaktion/m-wm/intern/Publikationen/Innovation/Innovationsstrategie_2020.pdf, last accessed 16/03/2021

Relation to circular bioeconomy	The bioeconomy is one of the five growth and future areas identified in the strategy. The sustainable bioeconomy not only enables marketable innovations, e.g. for securing biological raw materials from diffuse sources (waste, wastewater), but also offers diversification in the changing strong industries in the country ²⁷ .
Implementation	The BW innovation strategy has already been integrated and continues many measures that are already listed in other strategies in Baden-Württemberg (for example, the digitalisation strategy). Here again, for example, the "Initiative Wirtschaft 4.0" or the "Strategie Dialog Automobilindustrie" should be mentioned.
Territorial level	Regional
Interaction between levels	The innovation strategy is a prerequisite for funding from the European Regional Development Fund (ERDF) to flow to Baden-Württemberg. Measures from the strategy are also directly related to rural areas. The national innovation strategy connects the regional level, in that the national strategy is derived and individualized to the regional levels in terms of objectives of the regional strategy and the measures to the region. The competition "Regional Competitiveness through Innovation and Sustainability" (RegioWIN 2030) is to be continued and contributes to the fact that the improvement of location factors in the functional areas of the state as a structural and regional policy permanent task is systematically pursued as an ongoing structural and regional policy task.
Relation to S3	Driving collaboration from innovation stakeholders and the Smart Specialization Platform (S3) is one measure in the strategy. The S3 Platform ²⁸ provides advice to EU countries and regions for the design and implementation of their Smart Specialisation Strategy.

²⁸ <https://s3platform.jrc.ec.europa.eu/>, last accessed 19/01/2021

Digitalisation Strategy Baden-Württemberg (2017)	
Relation to demographic change	The digitization of healthcare plays a major role in the strategy. In view of the expected shortage of experts and high-skilled workers in turn with an aging population, especially in rural areas, telemedicine offers opportunities to reduce the care gap ²⁹ .
Relation to rural development	The strategy is intended to help keeping rural areas attractive with digital services. This includes, for example, full broadband coverage and expanded mobility concepts.
Relation to circular bioeconomy	No, only indirectly
Implementation	A number of measures have already been derived and implemented on the basis of the BW digitalization strategy. For example, the "Initiative Wirtschaft 4.0". This measure bundles cross-sectoral activities in the area of Economy 4.0. In the meantime, the Ministry of Economic Affairs, Labour and Housing Construction working together with 36 partners from associations, business organizations, business-related research institutions, companies and chambers to shape digitalization measures and initiatives in the most practice-oriented way possible.
Territorial level	Regional
Interaction between levels	The strategy will also help shape the regions. As an example, the municipalities are to be supported in shaping key policy areas such as mobility, education and health in cities and rural areas in a future-oriented and sustainable manner. ³⁰
Relation to S3	The digitalisation strategy focuses on the areas of intelligent mobility, digital start-ups, Economy 4.0, etc. and thus contributes directly to the future fields of strategic specialization.

²⁹ <https://www.digital-bw.de/downloads/DigitalisierungsstrategieBaWue2017.pdf>, last accessed 16/03/2021

³⁰ <https://www.digital-bw.de/publikationen>, Digitalisierungsstrategie BW, S. 14

b) Legal conditions

Due to the diversity of the bioeconomy, this topic is based on numerous laws and regulations at the national level. For example, the sustainability of wood production is promoted by nature conservation law and regional planning law. For the processing of raw materials, privileges for research and development facilities are anchored in industrial plant law. A circular economy law also provides a legal framework for the implementation of various bioeconomic processes³¹. In the field of the bioeconomy, there are numerous laws and standards that support the goals of the bioeconomy, but the legal framework needs to be adapted with regard to their enforcement. At the moment, existing policies in the field of bioeconomy can be divided into direct and indirect bioeconomy policies, the latter rather referring to the reduction of fossil fuels³². In many areas, aspects of the bioeconomy are not adequately considered in regulations due to their innovative nature or may even have an unintended inhibiting effect. One example of this is the Animal Health Implementation Act - TierGesAG, a law in which protection against the spread of animal diseases is anchored. This is currently inhibiting the development of insect biotechnology in Baden-Württemberg. In the **Baden-Württembergs government's sustainable bioeconomy strategy**, the examination of the inhibiting or promoting framework conditions is anchored as a measure. Also, how companies and municipalities can react to these in the future³³.

On the side of products, since 2021, a new supply chain law has been in force that obliges all companies to transparently map the supply chain from the raw material to the end product. The law is intended to make German companies accountable for human rights and environmental standards. An example for standards in the field of products and production-process is the eco-design European Directive³⁴. Under the leadership of the Federal Ministry of Economics and Technology, the German government has transposed the eco-design Directive into the German law with the "Energy-Related Products Act" (EVPG). The background is that products with similar functions and performance differ in their environmental impact, there is considerable potential here to relieve the environment and above all to reduce greenhouse gas emissions. The aim of the eco-design Directive is therefore to improve the environmental performance of energy-related products, considering their entire life cycle, by specifying eco-design requirements. Uniform EU-wide regulations prevent different national laws from becoming barriers to trade.

³¹ Ludwig et al. (2014) „Rechtsrahmen der Bioökonomie in Mitteldeutschland – Bestandsaufnahme und Bewertung“, UFZ Discussion Papers 22/2014, Leipzig: Helmholtz-Zentrum für Umweltforschung - UFZ

³² Pannicke et al. (2015) „The Political Economy of Fostering a Wood-based Bioeconomy in Germany“, The Political Economy of the Bioeconomy, GJAE 64

³³ „The Baden Württembergs government's sustainable bioeconomy strategy“, 2019

³⁴ <https://www.umweltbundesamt.de/themen/wirtschaft-konsum/produkte/oekodesign/oekodesign-richtlinie#umweltfreundliche-gestaltung-von-produkten>, last accessed 17/02/2021

c) Socio-economic conditions

Of Baden-Württemberg's inhabitants, 34% live in rural areas. This comprises about 70% of the state's land area and 30% of the workforce. 83% of the land area is allocated to the types of use forest and agriculture. In 2018, about 2,000 ha less agricultural land was counted than in the previous year³⁵. Baden-Württemberg has 12 universities and 66 higher education institutions (education, arts, applied sciences)³⁶. In 2019, 73% of citizens had an education degree, 20% had a university degree³⁷. More than ¼ of the universities in Baden-Württemberg are located in rural areas³⁸. Due to the COVID-19 pandemic, the proportion of foreign students in 2020 was 29% lower than in the previous year³⁹. In Baden-Württemberg, the gross domestic product amounted to 524 billion euros in 2019⁴⁰. In the second quarter of 2020, however, this fell by 13.9% compared to the previous year⁴¹. This was caused by the economic crisis in 2020, which was triggered by COVID-19. Economic output thus fell to its lowest level in the last 9 years. The COVID-19 pandemic also led to an increase in unemployment figures. In October 2020, 274,000 people were unemployed. This is 31% more than in the previous year⁴². By spatial category, the lowest unemployment rate of 4.7% is found in the urban areas, followed by the rural areas with 4.9% and the peripheral area with a slightly higher rate of 5.5%. Higher rates were recorded in small villages in particular⁴³. The pandemic poses a major challenge especially for employees in the tourism, culture or restaurant sector. The number of inhabitants in Baden-Württemberg in 2020 was higher than ever since the founding of the federal state, however, the increase in the number of inhabitants was very small compared to previous years⁴⁴. The reason is the deaths from the COVID-19 pandemic, but also a lower birth rate.

The amount of domestic biowaste collected separately in organic garbage cans or bags increased from 45.7 kilograms per inhabitant (kg/IH) in 2014 to 50.1 kg/IH in 2018. The proportion of domestic biowaste that could be fed into a combined fermentation and composting plant remained constant at around 40 percent⁴⁵. The Circular Economy Act stipulates that domestic biowaste must be collected separately from other household waste since 2015. In 2019, 48% of the biowaste was recycled in anaerobic digestion plants. In total, 67 million m³ of biogas with an average methane content of 62% was produced in waste fermentation plants in 2018. Of this,

³⁵ Statistisches Landesamt Baden-Württemberg, 2018

³⁶ <https://www.statistik-bw.de/BildungKultur/Hochschulen/Hochschularten.jsp>, last accessed 26/01/2021

³⁷ <https://www.statistik-bw.de/BildungKultur/BilStrukturAusgaben/MZbevAbschluss.jsp>, last accessed 26/01/2021

³⁸ <https://mlr.baden-wuerttemberg.de/de/unsere-themen/laendlicher-raum/politik-fuer-den-laendlichen-raum/landesagrarpolitik/landleben-allgemein/>, last accessed 26/01/2021

³⁹ <https://mlr.baden-wuerttemberg.de/de/unsere-themen/laendlicher-raum/politik-fuer-den-laendlichen-raum/landesagrarpolitik/landleben-allgemein/>, last accessed 26/01/2021

⁴⁰ <https://www.statistik-bw.de/GesamtwBranchen/VGR/LRtBWSjewPreise.jsp>, last accessed 26.01.2021

⁴¹ https://www.statistik-bw.de/Service/Veroeff/Statistische_Berichte/803920003.pdf, last accessed 26.01.2021

⁴² Arbeitsmarktreport Baden-Württemberg 2020, Statistik der Bundesagentur für Arbeit

⁴³ Entwicklung der Ländlichen Räume in Baden-Württemberg (IREUS/ILS, 2019)

⁴⁴ <https://www.statistik-bw.de/Presse/Pressemitteilungen/2021014>, last accessed 26/01/2021

⁴⁵ Indikatorenbericht Baden-Württemberg (2019)

almost 60 million m³ originated from municipal waste plants. Half of the total biogas produced was processed and fed into a (natural) gas network for delivery to energy suppliers or end consumers⁴⁶.

d) Technological conditions

In 2020, there were 708 scientific publications in the field of bioeconomy worldwide. Out of these, 124 were from Germany, and again 28% of those were from Baden Württemberg⁴⁷. The universities, colleges and research institutions in Baden-Württemberg cover the entire range of research topics that are important for the bioeconomy. These include, for example, agricultural science, forestry, plastics technology, materials science, textile technology, energy and many more. Research in the field of the bioeconomy is carried out in 13 research and competence centers. The University of Hohenheim in Stuttgart has the first bioeconomy degree programme in Europe. In Baden-Württemberg, there are 9 clusters and associations whose topics are related to the bioeconomy. In this way, research and industry can be networked in the field of bioeconomy - however, future work is still necessary for the bioeconomisation of clusters. Networking is also anchored in the bioeconomy strategy. Also, with focus on rural areas, actors, clusters and regions are to be networked more efficiently. The new funding programme "Sustainable Bioeconomy as an Innovation Engine for Rural Areas" from 2020 of the Ministry of Rural Affairs and Consumer Protection is intended to further support technology and knowledge transfer in the field of sustainable production and use of resources from regional agriculture and forestry⁴⁸. In order to be able to use biomass on a large industrial scale, it is necessary to develop new processes and machines which is done by research institutions. However, there are already companies in Baden-Württemberg that use biomass as a raw material base and have developed products or are developing processes⁴⁹.

e) Environmental conditions

The awareness of the climate change and the thereby triggered necessary sustainable development of the use of energy and resources is highly anchored as common sense in the society of Baden-Württemberg already since the 80s of the last century. There are activities, both politically and privately driven, to address biodiversity⁵⁰, preservation of habits and landscapes⁵¹.

⁴⁶ Abfallbilanz Baden-Württemberg (2019), Ministerium für Umwelt, Klima und Energiewirtschaft

⁴⁷ SCOPUS Analyzer („Bioeconomy 2020“), accessed 26/01/2021

⁴⁸ <https://mlr.baden-wuerttemberg.de/de/unsere-themen/biooekonomie-und-innovation/biooekonomie/foerderprogramm/>, last accessed 26/01/2020

⁴⁹ <https://www.biooekonomie-bw.de/bw/akteure/unternehmen>, last accessed 26/01/2020

⁵⁰ <https://www.baden-wuerttemberg.de/de/bw-gestalten/nachhaltiges-baden-wuerttemberg/naturschutz/biodiversitaet/>

⁵¹ <https://um.baden-wuerttemberg.de/en/topics/nature-conservation/>

Current climate change scenarios in the study "Future Climate Development in Baden-Württemberg" (2013)⁵² by the Baden-Württemberg State Institute for the Environment frames the basis for the state's adaptation strategy to the consequences of climate change. Due to its high level of industrialization, Baden-Württemberg is also a comparatively large contributor to global greenhouse gas emissions. An economically strong and ecologically sustainable agriculture is of high priority for the state government. The Common Agricultural Policy (CAP) has been helping to make agriculture more sustainable since 2015. For example, around 4.8 billion euros are available for direct payments that are linked to environmental measures. These greening measures include crop diversification, provision of ecological priority areas and maintenance of permanent grassland to protect biodiversity. Due to COVID-19, the new rules for the CAP will not be implemented until 2023, while in the transition period the existing rules will be maintained⁵³. For the future, the state would like to obtain additional funding in the next EU funding period 2021-2027 to allow for financial incentives and funding opportunities to support the ambitious goals. Preserving biodiversity and cultural landscapes is of high priority in Baden-Württemberg. Since 2017, there has been a special program to strengthen biodiversity, furthermore a Landscape Management Guideline (2015)⁵⁴, designated protected areas and a guide for overall biodiversity consulting (2012)⁵⁵.

4. Stakeholder inventory

Stakeholder group	Public
Stakeholder subgroup	Regional government
Position in the network	In Baden-Württemberg, there are 11 specialised ministries, more than half of them deal with the three core topics of GoDanuBio across the board. For example, advisory boards or expert councils, in which citizens can also participate, and regional development agencies contribute to the implementation or (further) development of strategies. Input is also provided by research institutions or regional and national associations. The ministries also play a strong role in public relations and communication of the individual topics. This is done through the publication of various brochures and press releases. As a federal country, each

⁵² <https://pudi.lubw.de/detailseite/-/publication/33837>

⁵³ <https://mlr.baden-wuerttemberg.de/de/unsere-themen/laendlicher-raum/politik-fuer-den-laendlichen-raum/eu-agrarpolitik/>

⁵⁴ <http://www.landesrecht-bw.de/jportal/?quelle=jlink&query=VVBW-MLR-20151028-SF&psml=bsbawueprod.psml&max=true&aiz=true>

⁵⁵ https://um.baden-wuerttemberg.de/fileadmin/redaktion/m-um/intern/Dateien/Dokumente/3_Umwelt/Naturschutz/Instrumente/Leitfaden_Gesamtbetriebliche_Biodiversitaetsberatung.pdf.

	federal state has its own ministries. Thus, even within Germany, networking or cooperation with the national networks can be beneficial and provide important input.
Importance for GoDanuBio	In Baden-Württemberg, the ministries are ultimately the ones who make decisions or adopt strategies. Therefore, the ministries have to be regularly informed and project results need to be duly disseminated. For the successful implementation of the strategies, the capitalization of the results of GoDanuBio through the respective ministries can be an asset. Regional development agencies, acting as state agencies, can play a major role on the implementation of capitalization measures (see following table).

Stakeholder group	Public
Stakeholder subgroup	State agencies
Position in the network	In Baden-Württemberg, there are state agencies that have a mandate from the government and act on its behalf, so to speak. One example is the project partner BIOPRO, a regional development agency. State agencies strengthen the innovative power of the region and act as catalysts for the competitiveness of SMEs through the networking of science and industry and the associated knowledge transfer.
Importance for GoDanuBio	State agencies play an important role in networking between ministries and projects - thus project results from GoDanuBio can be transferred directly to the ministries via the state agency. Via far-reaching networks of these agencies, the project message can thus be widely disseminated and capitalized.

Stakeholder group	Industry
Stakeholder subgroup	Cluster initiatives
Position in the network	The very well-established cluster landscape is a major asset for Baden-Württemberg's industry. The state's policy has been dealing with cluster policy for a very long time, making it a component of innovation and SME policy. It is intended to advance the networking of actors in Baden-Württemberg and

	thus strengthen the state's innovative power, which also increases competitiveness. However, the cluster landscape is not yet bioeconomised, but there are clusters in which the production and processing of biobased products already occurs.
Importance for GoDanuBio	Cluster initiatives are important for the GoDanuBio project because cluster management is very much in touch with SMEs. However, large companies such as global players are also present in a cluster. The goal is to network the companies, to build up cooperation and to create new innovative projects for the bioeconomy and to generate new products/processes. The cluster management is the mediator between state agencies, ministries and companies.

Stakeholder group	Industry
Stakeholder subgroup	SMEs
Position in the network	Baden-Württemberg as a business location is characterized by global players as well as innovative SMEs. More than 90 % of the companies in the state have less than 250 employees. In total, Baden-Württemberg has around 452,500 companies in total. Even in rural areas, Baden-Württemberg is home to research-intensive companies whose internal expenditure on research & development is significantly higher than the overall average in Germany. Another important factor is that Baden-Württemberg companies have strong cooperation with companies located in other federal states in the field of bioeconomy. This is based on the fact that BW covers the biobased value chain very well at the end, but not the beginning of the value chain.
Importance for GoDanuBio	SMEs in particular are the innovation drivers in Baden-Württemberg. In addition, more than 90 % of the companies are SMEs. It is precisely these companies that must be integrated and networked in the project in order to generate new innovations together. Without the facilitating role of a cluster, SMEs usually do not have the time capacity and financial resources to provide innovative services.

Stakeholder group	Academy
Stakeholder subgroup	Research and educational institutions
Position in the network	<p>In Baden-Württemberg, there are already examples of prominent institutions active in cooperate research activities between Universities, Universities of Applied Science, private as well as federal and state administrated Research Centres through jointly developed research strategies⁵⁶ by support and active work in research and education of at present important and interesting academic fields and also in circular bio-economy.</p> <p>These activities are supplemented through the networking of science and industry and the associated knowledge transfer of schools and Applied Research Academic Institutions as distribution across BW.</p> <p>It is important to mention here that the University Hohenheim in Stuttgart already has a Research Faculty of Bioeconomy⁵⁷.</p>
Importance for GoDanuBio	<p>Such research institutes play an important role in networking between ministries, SMEs/companies and society - thus project results from GoDanuBio can be transferred directly to local deployment agencies.</p> <p>Via far-reaching networks of these institutions, the project mission and results can thus be widely communicated and disseminated.</p>

Stakeholder group	Society
Stakeholder subgroup	NGOs and informal civil organizations
Position in the network	<p>In Baden-Württemberg, there are several examples as citizens' initiatives and non-profit organizations like associations which push topics as e. g. permaculture⁵⁸, e-mobility and renewable energies⁵⁹. Interesting to mention that, from a first glance, land use for agriculture and renewable energies (photovoltaic, wind,</p>

⁵⁶ Competence_Atlas Bio Economy Research_Stand_Dezember_2018

⁵⁷ <https://biooekonomie.uni-hohenheim.de/chief-bioeconomy-officer>

⁵⁸ <https://permakultur-info.de/category/deutschland/baden-wuerttemberg/>

⁵⁹ <https://smartgrids-bw.net/>

	<p>bio-methanol production, etc.) are contradictory but could be merged by combining both for example by Agri-Photovoltaic⁶⁰. The special characteristic about citizen initiatives is that there are events to different topics (among them, rural development), in which citizens' initiatives can speak directly with representatives of the regional government and local administration in order to present their concerns and ideas.</p>
Importance for GoDanuBio	<p>Such movements in the local society play an important role in networking between society, their ideas and regional/local administration; thus initiating proper projects and actions. GoDanuBio results could be directly transferred to citizens and local NGOs, increasing their awareness for transformative processes. With regard to the development of multi-level governance, the already existing cooperation between citizens' initiatives, regional/local administration and local deployment agencies is particularly important and can be an inspiration for further actions.</p>

⁶⁰ <https://www.pv-magazine.de/themen/agro-photovoltaik/>