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D3.1 - HANDBOOK ON POLICY MONITORING SYSTEM AND KEY PERFORMANCE INDICATORS

Due date	31.10.2023	**Delivery date**	
Work package	3		
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List of Abbreviations

BBP	Bio-based products
CS	Case studies
EU	European Union
EC-JRC	Joint Research Centre of the European Commission
KPI	Key Performance Indicator
NACE	Nomenclature statistique des Activités économiques dans la Communauté Européenne
NUTS	Nomenclature of territorial units for statistics
BERST	BioEconomy Regional Strategy Toolkit
OFMSW	Organic fraction of municipal solid waste

1 INTRODUCTION

The BIOMODEL4REGIONS project aims to support the establishment of the innovative governance models at local/regional level to achieve better-informed decision-making processes, social engagement and innovation to support and strengthen EU and international science-policy interfaces to achieve the Sustainable Development Goals. This is achieved by supporting the development of regional/local strategies, aiming at exploiting local potentials and innovations by integrating the opportunities created by the local bio-based economy. This approach emphasizes the role of regional bio-based economy governance systems and related policies for contributing to the broader bio-based economy transition. The BIOMODEL4REGIONS project validates the performance of the regional governance systems with stakeholders from six pilot regions. These pilots differ in terms of geographic location, conditions and assets, and dependence on forestry, agri-food, aquatic biomass and organic fraction of municipal solid waste (OFMSW). They are the following:

- Normandy Region (France)
- Delta Region Southwest (The Netherlands)
- Nitra Region (Slovakia)
- Regions Västerbotten, Jämtland and Norrbotten, Västernorrland (Sweden)
- Western Macedonia Region (Greece)
- Tuscany Region (Italy).

A robust regional governance framework is a precondition for any region that takes the bio-based economy as a pathway to reduce dependence on natural resources, transform manufacturing, promote sustainable production of renewable resources from land, fisheries and aquaculture and their conversion into food, feed, fibre, bio-based products and bio-energy, while growing new jobs and industries (EC Horizon, 2020). Such a framework supports the policy analysis and enables the monitoring and benchmarking of regions. It also strengthens the development of recommendations for how to achieve an improved bio-based economy governance in regions.

This Handbook outlines a generic framework to assess the governance of the bioeconomy in EU regions. The framework essentially describes different pathways for “good governance” on the bioeconomy, including generic and specific governance functions, assessment criteria and a set of profile- and governance indicators (KPIs). The Handbook aims to provide guidance on the data collection process for any regional/subnational authority or (bioeconomy) cluster organization that is interested in self-assessing the status-quo of its regional governance performance and the identification of possible -hotspots for improvement. As the application of the regional governance framework is still in progress as part of the pilot work in the BIOMODEL4REGIONS project and the set of KPIs not yet fully validated, this Handbook must be considered a first version with focus on the generic governance framework and the indicator set (Section 2 and Annex 2) as first applicable versions, while the data collection process, undertaken by the pilot regions (described in Annex 3), and the visualisations from the beta version of the preliminary dashboard in BERST (Section 3) – both less developed – should be understood as reports on work in progress.

The second version of the Handbook will appear in the course of 2024. At that time the final set of indicators will have been decided and populated with data. Also, experiences will have

been explored on how to assess the framework for policy analysis and for making recommendations on where and how governance elements could be improved at the regional level.

2 GENERIC BIOECONOMY GOVERNANCE ASSESSMENT FRAMEWORK

2.1 GOVERNANCE FRAMEWORK

The basis of the governance model analysis in BIOMODEL4REGIONS is a generic hybrid framework, which serves to derive a set of assessment criteria as well as indicators. The assessment framework is built upon three tiers, covering basic and specific (bioeconomy) governance functions as well as assessment criteria. The principal aim of the generic assessment framework is to self-assess the status-quo at sub-national level (municipality or region) with regard to bioeconomy governance, i.e., more specifically, with regard to exchange of information, the setting of rules and regulations and the availability of funding and biomass feedstock for successful implementation (1st tier).

The generic assessment framework and indicators sets (Table 2-1) are being tested with the six pilot regions in the BIOMODEL4REGIONS project and will be further developed and reported in a second version of this document, while considering the lessons learned from the application.

Table 2-1 General assessment framework-basic governance and specific bioeconomy governance functions

# (1)	Governance function (1st tier)	# (2)	Bioeconomy governance functions (2nd tier)	Description
1	**Information-sharing**	1.1	Consultation/collaboration/ information flow across actors	Denotes consultations or other collaboration processes as well as formalized flows of information on bioeconomy topics (e.g., between regional governments, cluster organizations, knowledge provider and consumers/the public).
		1.2	Accountability/transparency, certification & award schemes	Includes monitoring and reporting practices (e.g., between government agencies) and certification/award schemes for labelling or otherwise incentivizing BPPs (e.g. BB-content labelling, carbon foot printing etc.).
		1.3	Coordination, cooperation and multi-level governance	Denotes formalized coordination mechanisms as well as horizontal (inner or inter-departmental topical governance) and vertical collaboration (multi-level governance).
2	**Rule-setting**	2.1	(Regional) Policy incentives	This includes any public levers exercises to incentivize production of BBPs, such as

				taxes, subsidies, or Green Public Procurement (GPP).
		2.2	(Regional) Policy regulation	This includes regional regulatory policies or adoption/implementation of related national or EU policies (e.g., on waste, agriculture, forestry or trade)
		2.3	(Regional) Strategy and horizontal linkages	Denotes governance instruments related to vision creation, the setting of principal development directions, such as e.g., circular bioeconomy strategies.
3	**Implementation & finance**	3.1	Finance & investment	Focuses on the availability of public or private funding for bioeconomy innovations, project development and up-scaling/commercialization.
		3.2	Innovation, employment & value added	Includes status-quo assessments related to support mechanisms for innovation, bio-based employment and value added in sectors.
		3.3	Biomass & land use availability	Includes status-quo assessment on biomass availability (material flows) and land-use patterns.

The development of this *hybrid* assessment framework is based on a *virtual region approach*, aiming to derive generalizable relationships between a set group of actors in a normative way, creating an abstract, stylized depiction of bio-based economy governance that can be applied to the local context. It is *hybrid* in way that it is based on both literature review of sustainability governance principle and functions (see Andonova et al., 2009; Adríazola et al., 2018; Jännicke et al. 2015) and expert judgement and co-creation. It further aims to recognize and use where possible principles or viewpoints of *society-nature relations* (Haberl et al., 2016) by framing a bio-based economy governance as the key macro-economic and behavioural system that defines those relationships, operating at the overlapping sphere of nature and human society (cf. Pauliuk et al., 2017).

To ensure its suitability for the project's pilot regions, the model has been aligned where possible and sensible to the governance structure established in the six pilot regions of the BioModels4Regions project.

To further advance the methodology development based on initial desktop research and process design, a ‘participatory modelling’ approach was selected. Participatory modelling is understood as a “purposeful learning process for action that engages the implicit and explicit knowledge of stakeholders to create formalised and shared representations of reality”, in this case a representative model on the governance of bio-based economy in respective regions of the EU (Voinov et al., 2018). The primary aim of the participatory modelling exercise, implemented through focus group events as part of the BioModels4Regions project, was to validate what had already been developed as well as to co-create parts of the methodology.

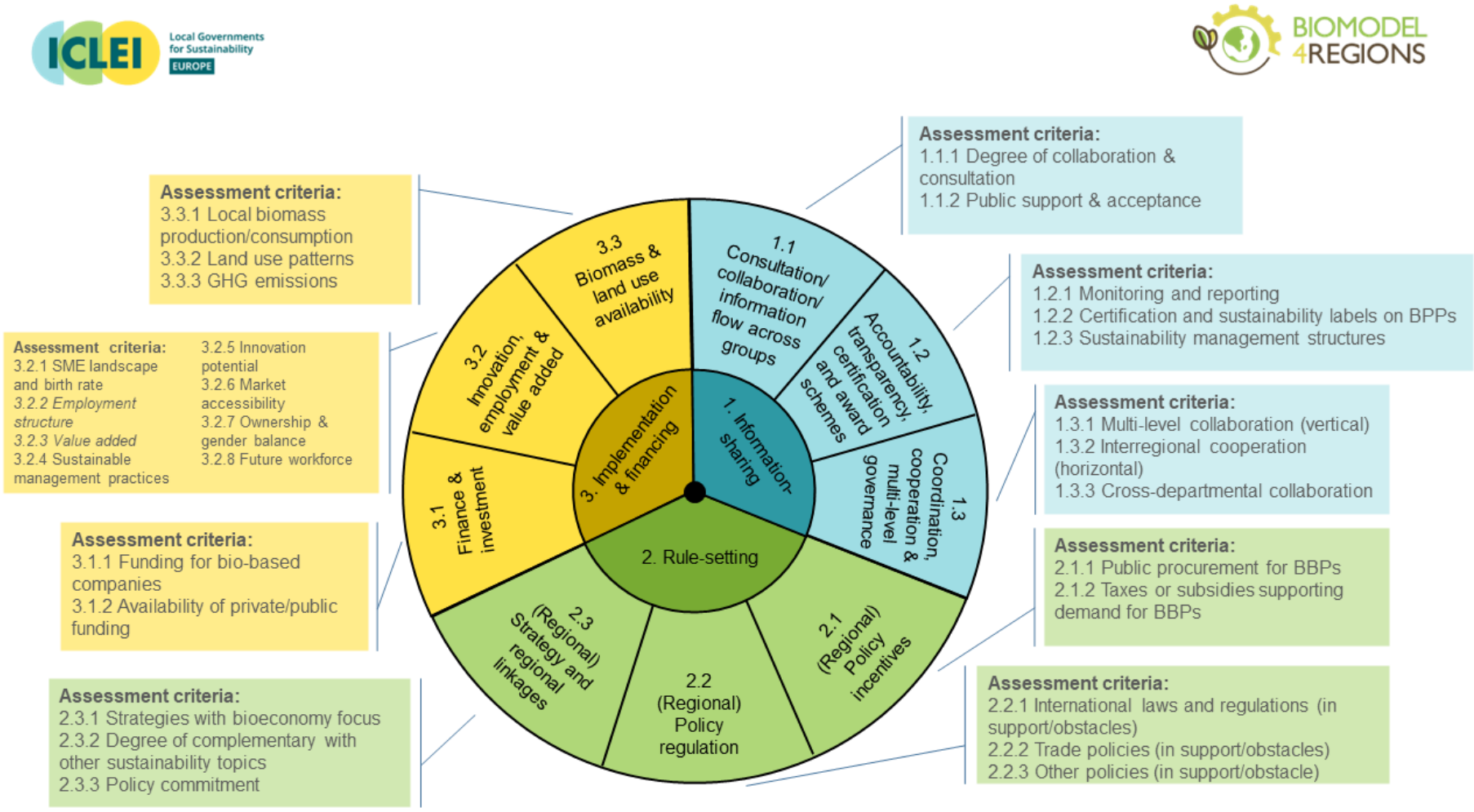

Figure 1: Generic bioeconomy governance assessment framework

The 3rd tier of the framework (see Figure 1), involves deriving a number of assessment criteria per 2nd tier function, describing key governance areas, which good practices/performance is being assessed (Table 2-2).

Table 2-2 Generic assessment framework – specific bioeconomy governance functions and assessment criteria

# (2)	Bioeconomy governance functions (2nd tier)	# (3)	Assessment criteria	Description/rationale
1.1	Consultation/ collaboration/ information flow across actors	1.1.1	Degree of collaboration & consultation	Describes the frequency, degree of formalization, or depth of collaboration between quadruple helix stakeholder relevant for the bioeconomy in the region.
		1.1.2	Public support & acceptance	Relates to the degree of public awareness about the bioeconomy/ BPPs and related projects or initiatives support by related campaigns or events.
1.2	Accountability/ transparency, certification & award schemes	1.2.1	Monitoring and reporting	Refers to monitoring and reporting schemes on the bioeconomy that are deployed by the local/regional/national government to promote transparency and accountability for set targets.
		1.2.2	Certification and sustainability labels on BPPS	Relates to existing certification schemes and labelling practices prevalent in the region (or the country) that are supporting the awareness raising on BBPs as their further penetration into the market.
1.3	Coordination, cooperation and multi-level governance	1.3.1	Multi-level collaboration (vertical)	Denotes the degree of collaboration / exchange on the bioeconomy between different government levels (local, regional, national EU).
		1.3.2	Interregional cooperation (horizontal)	Refers to cooperation mechanisms related to bioeconomy governance between ministries or agencies across different regions, municipalities or counties.
		1.3.3	Cross-departmental (inner-regional) collaboration	Refers to the degree of cross-departmental collaboration across the regional government (e.g., between departments of economy, international affairs, climate and environment)
2.1	(Regional) Policy incentives	2.1.1	Public procurements for BBPs	Assesses the degree to which public procurement is used to boost uptake of BBPs in the region.
		2.1.2	Taxes or subsidies supporting demand for BBPs	Refers to taxes or subsidies at regional (or national) level incentivizing the production or consumption of BBPs over conventional products.
2.2	(Regional) Policy regulation	2.2.1	International laws and regulations (in support/obstacles)	Refers to any national/international legislation, legislation or policy that supports/hinders to roll out of the regional bioeconomy, such as e.g., waste regulation,
		2.2.2	Trade policies (in support/obstacles)	Refers specifically to trade policies and their impact onto the regional bioeconomy.

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		2.2.3	Other policies (in support/obstacles)	Denotes any other kind of legislation, policies or strategies impacting the regional bioeconomy.
2.3	(Regional) Strategy and horizontal linkages	2.3.1	Strategies with bioeconomy focus	Assesses the existence and quality of the strategic set-up in the regional in terms of bioeconomy, e.g., through a dedicated regional bioeconomy strategy.
		2.3.2	Degree of complementary with other sustainability topics	Assesses the degree of complementarity of the bioeconomy strategy or related strategies with other sustainability areas that are regionally mandated, such as climate change mitigation and adaptation.
		2.3.3	Policy commitment	Denotes the commitment to the bioeconomy agenda in the regional government and its agencies, through vast horizontal involvement.
3.1	Finance & investment	3.1.1	Funding for bio-based companies	Assesses the access of funding (private/public) for BB-companies in the region.
			Availability of private/public funding	Assesses the availability of funding (private/public) for BB-companies in the region.
3.2	Innovation, employment & value added	3.2.1	SME landscape and birth rate	Refers to the size and volume of BB-start-up and SMEs as indication for the innovation potential of the region in relation to bioeconomy.
		3.2.2	*Employment structure (covered by profile indicators)*	Assesses the employment in BB-sectors as key indication of their size, relative importance and potential.
		3.2.3	*Value Added (covered by profile indicators)*	Assesses the employment in BB-sectors as key indication of their size, relative importance and potential.
		3.2.4	Sustainable management practices	Refers to sustainable management practices of BB-companies through e.g., sustainability credentials or certifications.
		3.2.5	Innovation potential	Assesses the bioeconomy innovation potential in the region, in terms of R&D landscape, pilot bioeconomy demonstration activities and through intellectual property rights.
		3.2.6	Market accessibility	Denotes a level playing field as key pre-requisite for a functioning regional bioeconomy market.
		3.2.7	Ownership & gender balance	Denotes the ownership structures of BB-companies as key indicator for the degree of inclusivity and gender equality of the bioeconomy sectors.
		3.2.8	Future workforce	Denotes the degree of pre-school, primary/secondary/tertiary education programmes as key a pre-requisite for building a future workforce locally that is able to deliver on the circular bioeconomy transition.
3.3	Biomass & land use availability	3.3.1	Local biomass production	Refers to the biomass extraction and production in the region, including blue biomass, water and soil.
		3.3.2	Land use patterns	Refers to land use patterns in the region, forestry, population density, as well as agricultural or horticultural density.

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2.2 KEY PERFORMANCE INDICATORS

A literature review has been conducted to identify possible indicators that fit to the assessment criteria as derived in tier-3 of the governance model framework (Figure 1). The literature largely focuses on empirical indicators for measuring economic and environmental drivers of the regional bioeconomy. On the other hand, governance indicators are not explored in any great depth. This is partly due to the data scarcity on specific governance indicators available in public statistics of the pilot regions (countries). Therefore, other data collection techniques (gathering, expert knowledge via survey, interview) are required to get insight in the status quo of the governance structure in a country or region.

Information has been searched from existing studies and reports (national, international; thematic and generic), and dashboards (online) and resulted into a long list of possible indicators. The list was validated by the stakeholders of the BIOMODEL4REGIONS pilots regarding their usefulness for assessing the status quo with regard to bioeconomy governance according to framework described. Collation of the indicators took place according to items presented in Table 2-3.

Table 2-3 Items of interest to identify and select indicators for populating the governance model

Item	Explanation
Indicator	Definition
Metrics	Quantitative measure; qualitative measure
Geographical scope	Country (nut0); region (nuts1, nuts2)
Sectoral scope	NACE A-I
Time path	Time series; state of art
Data source	Statistics (EU, national); interviews; survey
Other source	Dashboard; projects; reports
Useful for governance model	Yes, no
Assessment criteria	Governance criterion the indicator can be linked

Due to their character, indicators have been classified in two groups:

- *Profile indicators*: these are indicators that reflect the basic socio-economic performance in the pilot region. They are quantitative indicators and can mostly be obtained from secondary data collection, like public national statistics.
- *Governance indicators*: these are specific indicators that reflect the evaluation of the governance assessment criteria in tier-2 of the governance assessment framework. They are both qualitative and quantitative indicators and to be obtained from primary data collection, like stakeholder/expert knowledge.

Section 2.2.1 outlines the selected profile indicators per assessment criterion, while section 2.2.2 does the same for the governance indicators.

2.2.1 Profile indicators

Pilot regions in BIOMODEL4REGIONS geographically exist of one or more NUTS2 regions and economically cover one or more NACE sectors. Data for the profile indicators of the pilot regions are collected mainly from public sources like Eurostat, JRC and national sources (Table 2-4). More meta information on the profile indicators can be found in Annex 2.

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Table 2-4 Profile KPIs selected to characterize the governance model of pilot regions

Governance field	Assessment criteria	Indicator
Demographic	Population	Total population; population growth; population 15-65 years
Finance & investment	Finance	Total turnover of total industry; total turnover of total biobased industry; GDP in region
	Innovation	total number of research institutions
	Biobased share	Biobased shares in emerging industries (textile, wearing, leather, wood & wood products, paper & pulp, chemical, pharmaceutical, plastics, furniture, energy, waste collection, construction)
Innovation, employment & value added	Employment	Total regional employment; total employment of total regional industry; total bio-based industry employment Total regional companies; total companies in total regional industry; total biobased companies;
	Value added	Total value added in total regional industry; total value added in total biobased industry
	Enterprises	Total regional enterprises; total enterprises of total regional industry; total bio-based industry enterprises
Biomass & land use availability	Biomass availability	Total biomass production
	Land use	Total land area; total forestry land; total agricultural and horticultural land; total organic agricultural farming; total build areas

2.2.2 Governance indicators

Governance indicators are each described in depth below, using the following structure:

1.1.1.1 Indicator: [name]

Unique identifier: [#]
Assessment criteria: [name and reference #]
Impact pathway: [tier-1 name and reference #; tier-2 name and reference #]

Description: [description and rationale]
Metrics: [relevant metrics/units]
Geographical scope (system boundary): [e.g., nuts,1/2/3]
Data source: [indicative data source used by BioModels4Regions pilot experience]
Further comments/notice: [relevant comments according to BioModels4Regions pilot experience]

INFORMATION SHARING

Indicator: Presence of cluster organization

Unique identifier: 1.1.1.1
Assessment criteria: degree of collaboration and consultation, 1.1.1
Impact pathway: Consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

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Description: the indicator refers to whether a cluster organization exists in the system boundary and the specified year or not. A cluster organization is defined as a bioeconomy cluster, representing different kinds of regional stakeholders in the bioeconomy, including industries, academia or civil society/consumers.

A cluster organization can help synthesize knowledge on- and identify gaps -within the bioeconomy in the region as well as to facilitate addressing them, thus contributing collaboration and consultation as governance practice.

Metrics: yes/no

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: -

Indicator: industrial networks/PPP in the region

Unique identifier: 1.1.1.2
Assessment criteria: degree of collaboration and consultation, 1.1.1
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: The indicator refers to the share of bio-based companies in the system boundary which are organized in any kind of industrial networks and/or Public Private Partnerships (PPPs) or in cluster organization (see indicator 1.1.1.1).

Bio-based companies are defined in section 3.1.1. (see profile indicators)

Organized industries and Public Private Partnerships (PPP) can solicit project development and better financing of projects, through risk-sharing and thereby contribute to consultation and collaboration as governance principle.

Formula: *bio-based companies in industrial networks/total bio-based companies in the region*

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: The indicator requires the number of bio-based industries in system boundary as basis for calculation (see formulae in description).

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Indicator: Collaboration with universities or research institutes

Unique identifier: 1.1.1.3
Assessment criteria: degree of collaboration and consultation, 1.1.1
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: The indicator refers to the share of research institutions (such as universities, R&D institutions and other), which are in a formalized collaboration with the regional government or its agencies on topics related to the bioeconomy.

Formula: *Research institutions collaborating with cluster/total number of research institutions in region.*

Collaborations with universities as well as between academic actors helps the knowledge development, including for applied sciences in the region, attracts start-ups and SMEs and thus helps to position the region as bioeconomic business hub.

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: desktop research

Further comments/notice: the indicator requires the number of research institutions in system boundary as basis for the calculation (see formula in description).

Indicator: Collaboration in H2020, CBI-JU, HORIZON projects

Unique identifier: 1.1.1.4
Assessment criteria: degree of collaboration and consultation, 1.1.1
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: The indicator refers to the number of on-going European projects related to the bioeconomy in the specified year and system boundary.

The collaboration in European projects and initiatives can be viewed as key measure to stimulate pilot project implementation in the region and strengthen collaboration and consultation in the region and beyond.

Metrics: number

Geographical scope (system boundary): nuts2

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Data source: Partner knowledge and web-research, such as e.g., https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/knowledge-centres-and-data-portals_en

Further comments/notice: documentation of the project including project name, web-link, duration and grant number required.

Indicator: Collaboration in macro-regional projects

Unique identifier: 1.1.1.5
Assessment criteria: degree of collaboration and consultation, 1.1.1
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: The indicator refers to the number of projects related to bioeconomy with macro/inter regional scope and involvement (i.e., involving more than one nuts2 region in the country).

Inter-regional collaboration can be viewed as key instrument to inspire on the one hand side and to learn on the other, thus contributing to good collaboration and consultation practices in the region/country.

Metrics: number

Geographical scope (system boundary): nuts1/2

Data source: National government statistics; partner knowledge

Further comments/notice: documentation of the project including project name, web-link, duration and, if applying grant number, required e.g., BioEAST, BalticRegions, BE-RURAL, BioeconomyREVIER

Indicator: Companies in bioeconomy cluster

Unique identifier: 1.1.1.6
Assessment criteria: degree of collaboration and consultation, 1.1.1
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: The indicator measures the share of bio-based companies in the system boundary which are represented by the cluster organization.

Formula: *companies in cluster/bio-based companies total*

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A cluster organization can help synthesize knowledge on- and identify gaps -within the bioeconomy in the region as well as to facilitate addressing them, thus contributing collaboration and consultation as governance practice.

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: Indicator requires the number of bio-based firms in the system boundary. Please document the name of the companies identified.

Indicator: Bio-cluster integrated in science park

Unique identifier: 1.1.1.7
Assessment criteria: degree of collaboration and consultation, 1.1.1
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: Identify if the bioeconomy cluster is connected to a science park and the diversity of businesses linked to it, e.g. (mix of) private companies, R&D centres, technical institutes, universities.

The interlinkages of the bioeconomy cluster with the science park and other business or R&D stakeholder can further strengthen the impact of the cluster for the region.

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: Please state for the justification of the values selected if one or multiple of the following applies: includes R&D, laboratories, innovative SMEs, University, public research institutions.

Indicator: Campaigns/events to raise awareness on bio-based economy

Unique identifier: 1.1.2.1
Assessment criteria: public support and acceptance, 1.1.2
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: the indicator measures the communication to foster understanding and support to bio-based products steered by the region as share of the overall awareness raising campaigns

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undertaken by the region. This might include education programmes, initiatives or campaigns with the aim to raise awareness and public acceptance on BBPs specifically and the bioeconomy at large.

Formula: *number awareness raising activities/total number awareness raising activities in the region on industrial activities*

The lack of awareness on the bioeconomy and BBPs has been identified as one of the key barriers in many EU-projects (e.g. BIOVOICES). Addressing this gap through suitable events and activities is a core governance instrument and strongly contributes to public acceptance and support for the bioeconomy in the region.

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: partner knowledge; reginal government (e.g., regional development agency, department of education, economic development)

Further comments/notice: indicator requires the number of schools in the system boundary and the number of schools with a dedicated programme in place.

Indicator: Public support and acceptance

Unique identifier: 1.1.2.2
Assessment criteria: public support and acceptance, 1.1.2
Impact pathway: consultation/ collaboration/ information flow across actors, 1.1; information-sharing, 1

Description: the indicator represents a subjective self-assessment to grade the perceived degree of public acceptance towards BPPs in the region. This might not in all cases be distinguishable from support to bioeconomy in a wider sense.

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: Please provide some arguments on the grade given.

Indicator: Monitoring and reporting on the bio-based economy

Unique identifier: 1.2.1.1
Assessment criteria: monitoring and reporting, 1.2.1
Impact pathway: accountability/ transparency, certification and award schemes, 1.2; information-sharing,1

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Description: Monitoring and evaluation of bio-based economy may be integrated into sustainability monitoring or bioeconomy monitoring.

Monitoring practices, e.g., as part of bioeconomy strategy developed by the regional government, may be a key vehicle for promoting transparency and accountability towards citizens and businesses on set targets.

Metrics: absent / considered / planned / in preparation / published / revised

Geographical scope (system boundary): non-specific

Data source: partner knowledge

Further comments/notice: In case the evaluation provided refers to bioeconomy as a whole please indicate this in the comments.

Indicator: Certification and labels for BBPs

Unique identifier: 1.2.2.1
Assessment criteria: Certification and sustainability labels for BBPs, 1.2.2
Impact pathway: accountability/ transparency, certification and award schemes, 1.2; information-sharing,1

Description: The indicator measures the number of BBPs certified or labels with a recognised BBP focus.

Certificates and labels are recognized as key gap to further boost the update of the bioeconomy (e.g., BIOVOICES). Measuring the number of related labels schemes clearly contributes to promoting accountability and transparency in the bioeconomy.

Metrics: number

Geographical scope (system boundary): nuts1/2

Data source: partner knowledge

Further comments/notice: -

Indicator: Certification and labels explaining footprints of BBPs

Unique identifier: 1.2.2.2
Assessment criteria: Certification and sustainability labels for BBPs, 1.2.2
Impact pathway: accountability/ transparency, certification and award schemes, 1.2; information-sharing,1

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Description: the indicator refers to the share of certification and labels which focus on carbon footprints of BBPs.

Certificates and labels are recognized as key gap to further boost the update of the bioeconomy (e.g., BIOVOICES). Assessing the degree to which related BBP labels focus on carbon emission avoidance, helps advance the bioeconomy as a relevant concept in the context of environmental sustainability and as core strategy to promote it.

Metrics: share (%)

Geographical scope (system boundary): nuts1/2

Data source: partner knowledge

Further comments/notice: indicator requires the total number of bio-based companies in the system boundary.

Indicator: Share of companies with sustainability credentials

Unique identifier: 1.2.2.3
Assessment criteria: Certification and sustainability labels for BBPs, 1.2.2
Impact pathway: accountability/ transparency, certification and award schemes, 1.2; information-sharing,1

Description: the indicator refers to the share of bio-based companies in the system boundary which have sustainability credentials (e.g., EMAS or similar).

Formula: *bio-based companies with credentials/bio-based companies total.*

Assessing sustainability practices in BB-companies, clearly contributes to accountability and transparency as good governance principles. It also helps advance the bioeconomy as a relevant concept in the context of environmental sustainability and as a core strategy to promote it.

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: indicator requires the total number of bio-based companies in the system boundary (data collected under profile indicators) and the total bio-based companies with credentials (partner knowledge).

Indicator: Existence of Inter-ministerial cooperation to develop regional bioeconomy

Unique identifier: 1.3.1.1
Assessment criteria: multi-level collaboration (vertical), 1.3.1

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Impact pathway: coordination, cooperation and multi-level governance, 1.3; information-sharing, 1

Description: identification of the type of established forums / formalized exchange mechanisms between different government levels (local, regional, national, EU), i.e., between their dedicated departments mandated to develop the bioeconomy.

Inter-ministerial/ inter-municipal collaboration across different levels of government is a pre-condition for regional economic development. This type of formalized collaboration contributes to multi-level collaboration and more enhanced coordination on the bioeconomy as whole.

Metrics: in place / absent

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: the closed questions shows if there is any collaboration or not.

Indicator: Intensity of inter-ministerial forums

Unique identifier: 1.3.1.2
Assessment criteria: multi-level collaboration (vertical), 1.3.1
Impact pathway: coordination, cooperation and multi-level governance, 1.3; information-sharing, 1

Description: measures the number of inter-ministerial forums in the region.

Inter-ministerial/ inter-municipal collaboration across different levels of government is a pre-condition for regional economic development. This type of formalized collaboration contributes to multi-level collaboration and more enhanced coordination on the bioeconomy as whole.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: forums in this regard have a character of reoccurring events/ meetings in a formal setting.

Indicator: Existence of inter-regional cooperation to develop regional bioeconomy

Unique identifier: 1.3.2.1
Assessment criteria: interregional cooperation (horizontal), 1.3.2
Impact pathway: coordination, cooperation and multi-level governance, 1.3; information-sharing, 1

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Description: identification of the type of established forums / formalized exchange mechanisms between different regional agencies/ departments, i.e., between their dedicated departments mandated to develop the bioeconomy.

Interregional collaboration across different regions/ municipalities is a pre-condition for regional (bio)economic development. This type of formalized collaboration contributes to a more enhanced coordination on the bioeconomy as whole.

Metrics: in place / absent

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: the closed questions shows if there is any collaboration or not.

Indicator: Intensity of inter-regional forums

Unique identifier: 1.3.2.2
Assessment criteria: interregional cooperation (horizontal), 1.3.2
Impact pathway: coordination, cooperation and multi-level governance, 1.3; information-sharing, 1

Description: measures the number of inter-regional forums in the region / formalized exchange mechanisms between different regional agencies/ departments, i.e., between their dedicated departments mandated to develop the bioeconomy.

Interregional collaboration across different regions/ municipalities is a pre-condition for regional (bio)economic development. This type of formalized collaboration contributes to a more enhanced coordination on the bioeconomy as whole.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: forums in this regard have a character of recurring events/ meetings in a formal setting.

Indicator: Existence of dedicated administrative department to develop the bioeconomy (NEW)

Unique identifier: 1.3.2.3
Assessment criteria: cross-departmental (inner-regional) collaboration, 1.3.3 (NEW)
Impact pathway: coordination, cooperation and multi-level governance, 1.3; information-sharing, 1

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Description: the indicator measures the existence of a dedicated team / section / department in the regional administration mandated to develop the bioeconomy.

The existence of such an organizational set-up can help accelerate the development of the bioeconomy regionally, by overcoming departmental silos and synthesizing knowledge within the administration, while easing decision making through direct reporting to higher levels of decision making.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: [indicative data source used by BioModels4Regions pilot experience]

Further comments/notice: [relevant comments according to BioModels4Regions pilot experience]

RULE SETTING

Indicator: Bio-based public procurement policy

Unique identifier: 2.1.1.1
Assessment criteria: public procurement for BBP, 2.1.1
Impact pathway: (regional) policy incentives, 2.1, rule-setting, 2

Description: public procurement can support the market take-up as well as upscaling of BBPs. The indicator measures if bio-based public procurement policies are used by the regional administration.

Metrics: absent / considered / planned / in preparation / published / revised

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: documentation for justification of value required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or process.

Indicator: Tenders with bio-based requirements in procurement

Unique identifier: 2.1.1.2
Assessment criteria: public procurement for BBP, 2.1.1
Impact pathway: (regional) policy incentives, 2.1, rule-setting, 2

Description: the indicator measures the monetary volume of public tenders with bio-based requirements in procurement (tender or contract) including description of requirement.

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Metrics: Mio euros

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: documentation for justification of value indicated. Please indicate the contract/tender spec you are referring to.

Indicator: Policy incentives (tax, subsidies) supporting demand of bio-based products

Unique identifier: 2.1.2.1
Assessment criteria: taxes or subsidies supporting demand for BBPs, 2.1.2
Impact pathway: (regional) policy incentives, 2.1, rule-setting, 2

Description: the indicator measures if demand for bio-based products is promoted through financial instruments on national/regional level.

The use of tax or subsidies is a key national or to a lesser degree, regional governance instrument to incentivize producers and consumers of BBPs to prioritize such products over conventional solutions. The successful use of such policy instruments contributes to regional policy setting for the bioeconomy.

Metrics: absent / considered / planned / in preparation / published / revised

Geographical scope (system boundary): nuts0/1/2

Data source: partner knowledge

Further comments/notice: documentation for justification of value required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or process.

Indicator: Binding international laws & regulations (supporting bio-based economy)

Unique identifier: 2.2.1.1
Assessment criteria: international laws and regulations, 2.2.1
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: binding international laws and regulations give a back-drop against which some of the activities in the bio-based economy will be shaped. The indicator captures to which degree these international laws (e.g., related EU Directives) and regulations positively influence the development of the regional bio-based economy.

Metrics: very high / high / medium /low / very low / none

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Geographical scope (system boundary): nuts0

Data source: partner knowledge

Further comments/notice: documentation for justification of self-assessment required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or process.

Indicator: Binding international laws & regulations (supporting bio-based economy) – qualitative description (NEW)

Unique identifier: 2.2.1.2
Assessment criteria: international laws and regulations, 2.2.1
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: the indicator is a qualitative description that should list the English title (incl. reference numbers etc.) of the policy/document as well as a short description of why it is supporting / an obstacle for the bio-based economy in the region.

Metrics: qualitative description

Geographical scope (system boundary): nuts0

Data source: partner knowledge

Further comments/notice: -

Indicator: Binding international laws & regulations (obstacle for bio-based economy)

Unique identifier: 2.2.1.3
Assessment criteria: international laws and regulations, 2.2.1
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: Binding international laws and regulations give a back-drop against which some of the activities in the bio-based economy will be shaped. The indicator captures to which degree these international laws and regulations negatively influence the development of the regional bio-based economy.

Metrics: very high / high / medium /low / very low / none

Geographical scope (system boundary): nuts0

Data source: partner knowledge

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Further comments/notice: documentation for justification of self-assessment required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or process.

Indicator: Binding international laws & regulations (obstacle for bio-based economy) – qualitative description

Unique identifier: 2.2.1.4
Assessment criteria: international laws and regulations, 2.2.1
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: the indicator is a qualitative description that should list the English title (incl. reference numbers etc.) of the policy/document as well as a short description of why it is supporting/ an obstacle for the bio-based economy in the region.

Metrics: qualitative description

Geographical scope (system boundary): nuts0

Data source: partner knowledge

Further comments/notice: -

Indicator: Trade policies (supporting bio-based economy)

Unique identifier: 2.2.2.1
Assessment criteria: trade policies (in support/obstacle), 2.2.2
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: as a specific type of international law might support or hinder the development of the bio-based economy. Notably, if primary or secondary biomass needs to be important or the BBP is primarily of interest in the international market.

This indicator captures the degree to which such trade policies impact (positively) the regional bio-based economy development. This indicator is connection to a qualitative description (see indicator 2.2.2.2).

Metrics: very high / high / medium /low / very low / none

Geographical scope (system boundary): nuts1

Data source: partner knowledge

Further comments/notice: documentation for justification of value is required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or

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process. The region might, depending on the political system, have more or less influence on the process of transposition.

Indicator: Trade policies (supporting bio-based economy) – qualitative description

Unique identifier: 2.2.2.2
Assessment criteria: trade policies (in support/obstacle), 2.2.2
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: the indicator is a qualitative description that should list the English title (incl. reference numbers etc.) of the policy/document as well as a short description of why it is supporting the bio-based economy in the region / how it is having a positive impact.

Metrics: qualitative description

Geographical scope (system boundary): nuts1

Data source: partner knowledge

Further comments/notice: -

Indicator: Trade policies (obstacles for bio-based economy)

Unique identifier: 2.2.2.3
Assessment criteria: trade policies (in support/obstacle), 2.2.2
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: as a specific type of international law might support or hinder the development of the bio-based economy. Notably, if primary or secondary biomass needs to be important or the BBP is primarily of interest in the international market.

This indicator captures the degree to which such trade policies impact (negatively) the regional bio-based economy development. This indicator is connection to a qualitative description (see indicator 2.2.2.4).

Metrics: very high / high / medium /low / very low / none

Geographical scope (system boundary): nuts1

Data source: partner knowledge

Further comments/notice: documentation for justification of assessment is required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or process. The region might, depending on the political system, have more or less influence on the process of transposition of relevant trade policies.

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Indicator: Trade policies (obstacles for bio-based economy)

Unique identifier: 2.2.2.4
Assessment criteria: trade policies (in support/obstacle), 2.2.2
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: the indicator is a qualitative description that should list the English title (incl. reference numbers etc.) of the policy/document as well as a short description of why it is an obstacle for the bio-based in the region.

Metrics: qualitative description

Geographical scope (system boundary): nuts1

Data source: partner knowledge

Further comments/notice: -

Indicator: Policy regulations in place (supporting for bio-based economy)

Unique identifier: 2.2.3.1
Assessment criteria: Other policies (in support/obstacles), 2.2.3
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: the indicator captures to which degree national, regional, or European policies or regulations that are promoting/supporting the development of the regional bio-based economy (e.g., supply or processing).

A qualitative description of the rated policies is required for indicator 2.2.3.3.

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts0/1/2/3

Data source: partner knowledge

Further comments/notice: documentation for justification of the assessment required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or process.

Indicator: Policy regulations in place (obstacles for bio-based economy)

Unique identifier: 2.2.3.2
Assessment criteria: Other policies (in support/obstacles), 2.2.3

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Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: the indicator captures to which degree national, regional, or European policies or regulations that are limiting the development of the regional bio-based economy (e.g., supply or processing).

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts0/1/2/3

Data source: partner knowledge

Further comments/notice: documentation for justification of the assessment required. Please indicate the policy you are referring to giving the name of the policy, the status and link to the document or process.

Indicator: Policy regulations in place (supporting/limiting bio-based economy)

Unique identifier: 2.2.3.4
Assessment criteria: Other policies (in support/obstacles), 2.2.3
Impact pathway: (regional) policy regulation, 2.2; rule-setting, 2

Description: the indicator is a qualitative description that should list the English title (and relevant reference numbers) of the policy/document as well as a short description of why it is supporting/ an obstacle for the bio-based economy in the region.

Metrics: qualitative description

Geographical scope (system boundary): nuts0/1/2/3

Data source: partner knowledge

Further comments/notice: -

Indicator: Dedicated regional bioeconomy strategies

Unique identifier: 2.3.1.1
Assessment criteria: strategies with bioeconomy focus, 2.3.1
Impact pathway: (regional) strategy and horizontal linkages, 2.3; rule-setting, 2

Description: Regional bioeconomy strategies are in many cases strongly interlinked with the bio-based economy. The indicator captures if such dedicated bioeconomy strategies are in place in the target region at regional or national level.

Metrics: absent / considered / planned / in preparation / published / revised

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Geographical scope (system boundary): nuts1/2

Data source: partner knowledge

Further comments/notice: the reference to 'bioeconomy' and not to 'bio-based economy' is specifically chosen here to denote the wider scope these strategies could have, i.e., beyond the bio-based economy.

Indicator: Regional strategies with links to bioeconomy and bio-based economy

Unique identifier: 2.3.2.1
Assessment criteria: degree of complementarity with other sustainability topics, 2.3.2
Impact pathway: (regional) strategy and horizontal linkages, 2.3; rule-setting, 2

Description: the indicator quantifies those regional policies, strategies and instruments that link to goals of the bioeconomy.

A bioeconomy strategy, which is broadly linked to other policy areas of the region, is viewed positively and can be part of integrated approach to sustainable urban or regional development.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: the reference to 'bioeconomy' and not to 'bio-based economy' is specifically chosen here to denote the wider scope these strategies could have, i.e., beyond the bio-based economy.

Indicator: Number of government departments and agencies involved in bioeconomy strategy roll-out/implementation

Unique identifier: 2.3.3.1
Assessment criteria: policy commitment, 2.3.3
Impact pathway: (regional) strategy and horizontal linkages, 2.3; rule-setting, 2

Description: the indicator captures all regional government departments, or related agencies that are involved in the development and/or roll-out/implementation of the bioeconomy.

Broad participation of different departments within the regional administration, indicates a strong commitment to the policy objectives of the bioeconomy.

Metrics: number

Geographical scope (system boundary): nuts2

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Data source: partner knowledge

Further comments/notice: the reference to 'bioeconomy' and not to 'bio-based economy' is specifically chosen here to denote the wider scope these strategies could have, i.e., beyond the bio-based economy.

Indicator: Policy commitment to bioeconomy and bio-based economy strategy implementation through in media

Unique identifier: [#]
Assessment criteria: policy commitment, 2.3.3
Impact pathway: (regional) strategy and horizontal linkages, 2.3; rule-setting, 2

Description: the indicator captures the degree to which different communication channels have been used to inform about the bio-based economy. This may include a variety of channels (social media, newspaper etc.) and stakeholders by policy makers and institutions (governmental agencies, ministers etc.)

A very diverse number of channels would constitute a 'very high' rating and thus indicate a strong policy commitment by the involved department, agencies and ministries at regional level.

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: n.a.

IMPLEMENTATION & FINANCE

Indicator: Access to private funds used by the biobased companies

Unique identifier: 3.1.1.1
Assessment criteria: funding for bio-based companies, 3.1.1
Impact pathway: finance and investment, 3.1; implementation and finance, 3

Description: funding opportunities will support the establishment of bio-based companies. This indicator measures qualitatively the access to private funding in general, or for a specific bio-based sector, depending on the scope of the assessment.

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

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Further comments/notice: documentation for justification of value required. Please provide link to the sources. For BERST CS regions, date is available: biobased delta (NL), Westland (NL), Straubing (DE),Western Macedonia (GR), FPCM (ES), Central Finland (FI).

Indicator: Access to public funds used by biobased companies

Unique identifier: 3.1.1.2
Assessment criteria: funding for bio-based companies, 3.1.1
Impact pathway: finance and investment, 3.1; implementation and finance, 3

Description: funding opportunities will support the establishment of bio-based companies. This indicator measures qualitatively the access to public funding in general, or for a specific bio-based sector, depending on the scope of the assessment.

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: documentation for justification of value required. Please provide link to the sources. For BERST CS regions, date is available: biobased delta (NL), Westland (NL), Straubing (DE),Western Macedonia (GR), FPCM (ES), Central Finland (FI).

Indicator: Availability of private funding

Unique identifier: 3.1.2.1
Assessment criteria: availability of funding for bio-based companies, 3.1.2
Impact pathway: finance and investment, 3.1; implementation and finance, 3

Description: funding opportunities will support the establishment of bio-based companies. This indicator measures quantitatively the volume of private funding in the regional bioeconomy sectors (including all types of funding other than public institution).

Metrics: Mio euros

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: -

Indicator: Availability of public funding

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Unique identifier: 3.1.2.2
Assessment criteria: availability of funding for bio-based companies, 3.1.2
Impact pathway: finance and investment, 3.1; implementation and finance, 3

Description: funding opportunities will support the establishment of bio-based companies. This indicator measures quantitatively the volume of public funding in the regional bioeconomy sectors (including all types of funding other than public institution).

Metrics: Mio euros

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: -

Indicator: Bio-based SME birth rate

Unique identifier: 3.2.1.1
Assessment criteria: SME landscape and birth rate, 3.2.1
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: to better understand the regional dynamic of bio-based innovations entering the market, this indicator measures the growth rate of bio-based companies starting business.

Formula: *((bio-based companies in year n) - (bio-based businesses in year n-1)/ bio-based businesses in year n-1)*100*

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: data available on BERST for BE, DE, EE, ES, FI, GR, LV, NL, NO, PL, SI and UK ; for 2016.

Indicator: Presence of incubator

Unique identifier: 3.2.1.2
Assessment criteria: SME landscape and birth rate, 3.2.1
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

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Description: the indicator measures if an incubator exists and whether it is actively promoting bio-based economy. Incubators may support the link between innovation and markets and therefore constitute a good indication for the innovation dynamic in the region.

Metrics: activity level (yes/no)

Geographical scope (system boundary): nuts2/3

Data source: partner knowledge

Further comments/notice: For BERST CS regions: biobased delta (NL), Westland (NL), Straubing (DE),Western Macedonia (GR), FPCM (ES), Central Finland (FI).

Indicator: Regional guidance on sustainability practices for bio-based economy sector

Unique identifier: 3.2.4.1
Assessment criteria: sustainable management practices, 3.2.4
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: the implementation of governance along ecological, economic and social criteria can be measured the existence of regional guidance, support schemes, which are being issued and adopted by bio-based companies.

The indicator captures the status of such guidance in the region.

Metrics: absent / considered / planned / in preparation / published / revised

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: documentation for justification of assessment is required. Please provide link to the sources where possible.

Indicator: Certified regional bio-based value chains

Unique identifier: 3.2.4.2
Assessment criteria: sustainable management practices, 3.2.4
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: the number of certified biobased products in a region can measure the sustainability level.

Metrics: number

Geographical scope (system boundary): nuts2

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Data source: partner knowledge

Further comments/notice: documentation for justification of assessment is required. Please provide link to the sources where possible.

Indicator: R&D expenditure

Unique identifier: 3.2.5.1
Assessment criteria: innovation potential, 3.2.5
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: the indicator captures an estimate of public/private expenditure for R&D in the region (not differentiating between bio-based on non-bio-based).

The overall regional R&D expenditure on the regional level may indicate the general innovation landscape and hint at favouring or limiting conditions.

Metrics: Mio euros

Geographical scope (system boundary): nuts2

Data source: regional Innovation Scoreboard & Innovation Union Scoreboard; chamber of commerce

Further comments/notice: documentation for justification of assessment is required. Please provide link to the sources where possible. Available on BERST for: BE, DE, EE, ES, FI, GR, LV, NL, NO, PL, SI and UK ; for 2016.

Indicator: Pilot and Demonstration facilities

Unique identifier: 3.2.5.2
Assessment criteria: innovation potential, 3.2.5
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: pilot and demonstration facilities represent bridges between generating basic knowledge and technological breakthroughs, and industrial applications and commercial adoption. The indicator measures the number of pilots and demonstration facilities in the regional bioeconomy.

Metrics: absent / considered / planned / in preparation / published / revised

Geographical scope (system boundary): nuts2

Data source: regional Innovation Scoreboard & Innovation Union Scoreboard; chamber of commerce

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Further comments/notice: since the regions are rather different in size, we propose a qualitative measurement. However, documentation for justification of value is required. Please provide link to the sources and the number of facilities.

Indicator: Intellectual property rights

Unique identifier: 3.2.5.3
Assessment criteria: innovation potential, 3.2.5
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: the indicator captures the number of regionally patented bio-based products, which provides a good general indication on the bio-based innovation potential in the region.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: regional Innovation Scoreboard & Innovation Union Scoreboard; chamber of commerce

Further comments/notice: documentation for justification of assessment is required. Please provide link to the sources where possible.

Indicator: Level playing field

Unique identifier: 3.2.6.1
Assessment criteria: market accessibility, 3.2.6
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: equal opportunities in the open market are measured through the indicator level playing field. It measures if bioeconomy and bio-based economy are equally supported as the fossil-based economy by the institutions setting the relevant framework conditions.

The indicator constitutes a qualitative self-assessment, to capture the degree to which such level playing field is perceived as such for the regional bio-based economy, or not.

Metrics: very high/ high / medium / low / very low / none

Geographical scope (system boundary): nuts1/2

Data source: regional Innovation Scoreboard & Innovation Union Scoreboard; chamber of commerce

Further comments/notice: documentation for justification of assessment is required. Please provide link to the sources where possible.

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Indicator: Licensing new permits indirectly linked to BBPs (e.g., building permits etc.)

Unique identifier: 3.2.6.2
Assessment criteria: market accessibility, 3.2.6
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: The indicator measures (qualitative self-assessment) the rate of licenses given which are linked (directly or indirectly) to BBPs.

The indicator results imply indication on the bureaucratic burden, given by a qualitative description on the process of permits indirectly linked to BBP (e.g., building permits etc.) as a proxy for the framework conditions prevalent in the regions to support the BB-economy through a quick and dynamic licensing process.

Metrics: very high/ high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: documentation for justification of assessment is required. Please provide link to the sources where possible.

Indicator: Existence of good practices for developing regional bioeconomy

Unique identifier: 3.2.6.3
Assessment criteria: market accessibility, 3.2.6
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: indicator qualitatively assesses whether good practices on market accessibility are exist for the region, implying that good practices are helpful to develop the bioeconomy in region.

Metrics: yes / not available

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: documentation for justification of assessment is required. Please provide link to the sources where possible.

Indicator: Share of cooperatives

Unique identifier: 3.2.7.1

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Assessment criteria: ownership and gender balance, 3.2.7
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: indicating the share of cooperatives as a type of company of the overall bio-based /bio-based businesses in the region.

Formula: *number of BB-cooperative/total number of BB-companies*

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: regional Innovation Scoreboard & Innovation Union Scoreboard; chamber of commerce

Further comments/notice: documentation for justification of assessment is required.

Indicator: Share of female led business of total businesses in biobased-economy in the region

Unique identifier: 3.2.7.2
Assessment criteria: ownership and gender balance, 3.2.7
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: indicating the share of female-lead businesses of the overall bio-based businesses in the region.

Formula: *number of BB-cooperative/total number of BB-companies.*

Metrics: share (%)

Geographical scope (system boundary): nuts2

Data source: regional Innovation Scoreboard & Innovation Union Scoreboard; chamber of commerce

Further comments/notice: documentation for justification of assessment is required.

Indicator: Pre-school education programs

Unique identifier: 3.2.8.1
Assessment criteria: future workforce, 3.2.8
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: number of existing programmes in pre-school education included in the curriculum that inform and teach on bioeconomy and bio-based economy.

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The existence of such programs is a good proxy for the development of a skilled workforce, able to deliver on the objectives of the bioeconomy.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: national statistics

Further comments/notice: documentation for justification of assessment is required.

Indicator: Primary education programs

Unique identifier: 3.2.8.2
Assessment criteria: future workforce, 3.2.8
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: number of existing programmes in primary education included in the curriculum that inform and teach on bioeconomy and bio-based economy.

The existence of such programs is a good proxy for the development of a skilled workforce, able to deliver on the objectives of the bioeconomy.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: national statistics

Further comments/notice: documentation for justification of assessment is required.

Indicator: Secondary education programs

Unique identifier: 3.2.8.3
Assessment criteria: future workforce, 3.2.8
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: number of existing programmes in secondary education included in the curriculum that inform and teach on bioeconomy and bio-based economy.

The existence of such programs is a good proxy for the development of a skilled workforce, able to deliver on the objectives of the bioeconomy.

Metrics: number

Geographical scope (system boundary): nuts2

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101060476

Data source: national statistics

Further comments/notice: documentation for justification of assessment is required.

Indicator: Tertiary education programs

Unique identifier: 3.2.8.4
Assessment criteria: future workforce, 3.2.8
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: number of existing programmes in tertiary education included in the curriculum that inform and teach on bioeconomy and bio-based economy.

The existence of such programs is a good proxy for the development of a skilled workforce, able to deliver on the objectives of the bioeconomy.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: national statistics

Further comments/notice: documentation for justification of assessment is required.

Indicator: Number of vocational programmes on bio-based economy

Unique identifier: 3.2.8.5
Assessment criteria: future workforce, 3.2.8
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: reskilling and upskilling on bio-based topics included in the curriculum that inform and teach on bioeconomy and bio-based economy.

The existence of such programs is a good proxy for the development of a skilled workforce, able to deliver on the objectives of the bioeconomy.

Metrics: number

Geographical scope (system boundary): nuts2

Data source: national statistics

Further comments/notice: documentation for justification of assessment is required.

Indicator: Presence of human capital agenda

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Unique identifier: 3.2.8.6
Assessment criteria: future workforce, 3.2.8
Impact pathway: innovation, employment and value added, 3.2; implementation and finance, 3

Description: human capital agenda is an agenda which identifies and tackles the discrepancies in the labour market on demand and supply of personnel.

The existence of such systemic approach is a good proxy for how the region is addressing the issue strategically.

Metrics: absent / considered / planned / in preparation / published / revised

Geographical scope (system boundary): nuts2

Data source: national statistics

Further comments/notice: documentation for justification of assessment is required.

Indicator: Domestic material consumption (DMC) – agricultural biomass

Unique identifier: 3.3.1.1
Assessment criteria: local biomass production, 3.3.1
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

Description: the indicator captures the availability of agricultural biomass (using the MFA Eurostat methodology and data). The indicator is represented by the Domestic Material Consumption (DMC) of the specific biomass stream, relevant for the region.

Metrics: kilo tonnes

Geographical scope (system boundary): nuts1/2

Data source: Eurostat

Further comments/notice: For general information on Material Flow Accounting – MFA, including the DMC indicator, please see Eurostat.

Indicators were not used as such by the BIOMODEL4REGIONS pilot regions for now. Local biomass types were estimated for nuts2 level from EC-JRC data at nuts0 level in previous section on profile indicators. These have been assigned to regions/nuts2 based on agr/forestry/waste land use types.

Indicator: Domestic material consumption (DMC) – blue biomass

Unique identifier: 3.3.1.2
Assessment criteria: local biomass production, 3.3.1
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

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Description: the indicator captures the availability of blue biomass (using the MFA Eurostat methodology and data). The indicator is represented by the Domestic Material Consumption (DMC) of the specific biomass stream, relevant for the region.

Metrics: kilo tonnes

Geographical scope (system boundary): nuts1/2

Data source: Eurostat

Further comments/notice: For general information on Material Flow Accounting – MFA, including the DMC indicator, please see Eurostat.

Indicators were not used as such by the BIOMODEL4REGIONS pilot regions for now. Local biomass types were estimated for nuts2 level from EC-JRC data at nuts0 level in previous section on profile indicators. These have been assigned to regions/nuts2 based on agr/forestry/waste land use types.

Indicator: Domestic material consumption (DMC) – forestry biomass

Unique identifier: 3.3.1.3
Assessment criteria: local biomass production/consumption, 3.3.1
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

Description: the indicator captures the availability of forestry biomass (using the MFA Eurostat methodology and data). The indicator is represented by the Domestic Material Consumption (DMC) of the specific biomass stream, relevant for the region.

Metrics: kilo tonnes

Geographical scope (system boundary): nuts1/2

Data source: Eurostat

Further comments/notice: For general information on Material Flow Accounting – MFA, including the DMC indicator, please see Eurostat.

Indicators were not used as such by the BIOMODEL4REGIONS pilot regions for now. Local biomass types were estimated for nuts2 level from EC-JRC data at nuts0 level in previous section on profile indicators. These have been assigned to regions/nuts2 based on agr/forestry/waste land use types.

Indicator: Waste generation – biomass

Unique identifier: 3.3.1.4
Assessment criteria: local biomass production/consumption, 3.3.1
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

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Description: the indicator captures the amount of waste generated in the region, including biomass derived waste from agriculture, forestry and marine ecosystems.

Metrics: kilo tonnes

Geographical scope (system boundary): nuts1/2

Data source: national/regional/municipal statistics; Eurostat

Further comments/notice: -

Indicator: Biomass gap (qualitative)

Unique identifier: 3.3.1.5
Assessment criteria: local biomass production/consumption, 3.3.1
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

Description: the gap of sustainable biomass supply vs biomass demand for materials will be measured depending on the pilots focus.

Formula: *demand for biomass feedstock - availability of biomass feedstock*

Metrics: import needed from rest of country, import needed from EU, import needed from non-EU, no gap, export to rest of country, export to EU, export to non-EU

Geographical scope (system boundary): nuts 2

Data source: partner knowledge

Further comments/notice: partner knowledge. Regional partners should give an indication whether the region a) produces enough biomass for materials, or b) need imports from the rest of the country, or c) needs imports from the rest of the EU or world.

Indicator: Presence of continuous supply of biomass with constant quality

Unique identifier: 3.3.1.6
Assessment criteria: local biomass production/consumption, 3.3.1
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

Description: The indicator measures (through qualitative self-assessment) the continuity in deliveries of biomass of high quality to the regional bio-based industries.

The stability of biomass (feedstock) availability or supply is a good indication for the potential for the BB-economy in the region.

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Metrics: very high/ high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: -

Indicator: Resource (incl. water and soil) and energy efficiency practices (qualitative)

Unique identifier: 3.3.1.7
Assessment criteria: local biomass production/consumption, 3.3.1
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

Description: Estimates the use and implementation of resource efficiency in the regional bio-based economy.

Metrics: very high / high / medium / low / very low / none

Geographical scope (system boundary): nuts2

Data source: partner knowledge

Further comments/notice: -

Indicator: Land-use change

Unique identifier: 3.3.2.1
Assessment criteria: land-use patterns, 3.3.2
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

Description: land-use change might impact the primary production of biomass and limit resource input to the bio-based economy. The changes in land-use patterns over time will be measured on a regional basis.

Metrics: annual percentage change

Geographical scope (system boundary): nuts2

Data source: Eurostat; CORIN

Further comments/notice: Documentation for justification required.

Indicator: GHG emissions per selected sector (NEW)

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Unique identifier: 3.3.3.1
Assessment criteria: GHG emissions, 3.3.3 (NEW)
Impact pathway: biomass and land use availability, 3.3; implementation and finance, 3

Description: Indicating the CO2 equivalence emissions in the region's sector represented in the project. CO2 equivalents are calculated as an aggregate of N2O, CH4 and CO2 emissions.

Metrics: tCO2 eq.

Geographical scope (system boundary): nuts 2

Data source: Eurostat; regional statistics

Further comments/notice: documentation for justification required.

Finally, Annex 2 gives a complete overview of all KPIs in terms of definition, metrics, data source, geographic and temporal scope, and position in the governance model framework.

2.2.3 Benchmarking

As indicated above, the indicators should be used to assess (or self-assess) the status quo with regard to the assessment criteria. However, in order to understand whether the obtained values indicate a 'good', 'poor' or 'medium' performance, benchmarks will be added to the framework which will allow scoring of specific assessment criteria (3rd tier) or bioeconomy governance functions (2nd tier). The benchmarks are still being developed and applied to the test case in BIOMODEL4REGIONS and will be added in the updated version of this deliverable. The benchmarks will be created using literature reviews, project reports and studies as well as expert judgement.

3. BERST DASHBOARD WITH GOVERNANCE INDICATORS

3.1 BACKGROUND

The BIOMODEL4REGIONS project develops an on-line dashboard system that helps to visualise the performance of governance models in the pilot regions – and in principle any other EU region as long as data have been gathered – for a set of KPIs. Data for these indicators are stored in a robust and standardised data warehouse and harmonised in their definitions and metrics in order to make them comparable across regions. The performance of the regional governance indicators is monitored and visualised by figures, maps and infographics. Dynamic factsheets with storytelling on the status of the indicators are (automatically) prepared following a template.

The "BioEconomy Regional Strategy Toolkit'' project (2011-2014; Van Leeuwen, 2016) launched the BERST dashboard, which was then further extended in the RDI2Club project (2018-2020). The BIOMODEL4REGIONS project takes this BERST dashboard as entry point for storing, updating, analysing and visualising regional governance indicators in a user-friendly and sustainable way. The BERST dashboard builds upon standard, certified SWING software (https://swing.eu/content/Swing-Mosaic) that is being designed to the preferences of the BIOMODEL4REGIONS project in terms of

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style, contents of indicators, use of infographics, use of language (English). Guided by the regional project partners standard story telling reports/factsheets will be developed that support policy analyses and determine tailor-made actions for improving the regional governance structure (task 3.3).

This ongoing work is coordinated and executed by an appointed administrator, which is the WUR partner in the BIOMODEL4REGIONS project during the project lifetime. The dashboard will remain accessible for analysis and benchmarking for in principle any EU region (nuts2) until one year after project duration. The dashboard is hosted by the software developer, ABF software in the Netherlands (www.abfreserach.nl).

3.2 DASHBOARD FEATURES

The software and hardware used to transfer the BERST dashboard to the needs of the BIOMODEL4REGIONS project guarantees a system that can monitor and analyse indicators across regions (NUTS0, NUTS1, NUTS2) and over time. This section 3.2 highlights the main features of the dashboard and showcases them by print shots taken from the BERST dashboard anno 2020 (weblink: https://berst.databank.nl/dashboard/en-gb/dashboard/). This version forms the start point of the BERST governance dashboard version that is being developed in the BIOMODEL4REGIONS project. Section 3.3 gives insight in the preliminary (beta) version of that one, which is work in progress.

The BERST dashboard has the layout of a mosaic system with themes of indicators and/or reports, e.g., ‘Biomass availability and Land use’, ‘Demographic and Workforce quality’, or ‘Regional profile reports’ (Figure 2).

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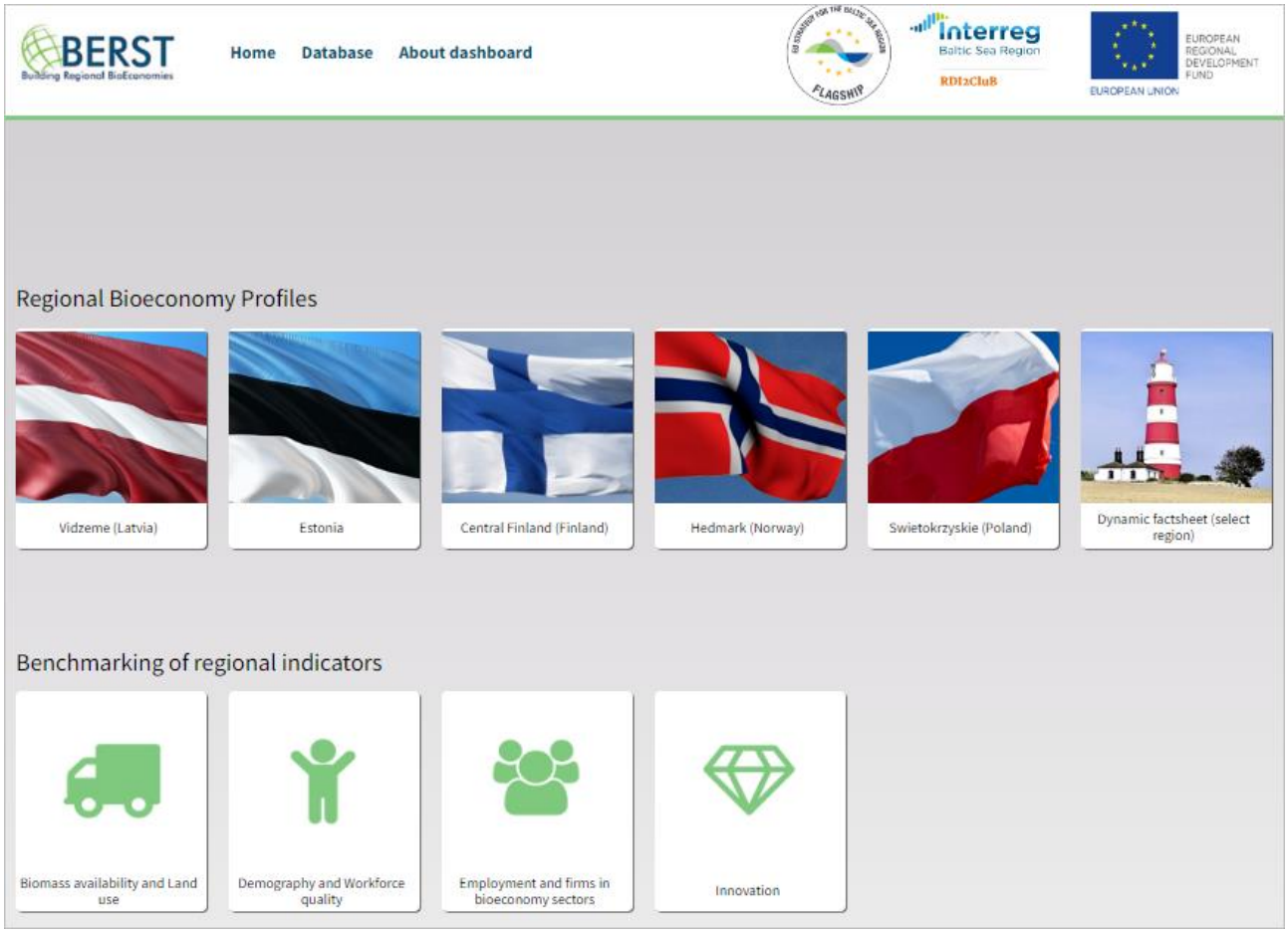

Figure 2 Opening screen with themes in current BERST dashboard

The BERST dashboard has graphical interfaces to visualise the regional data, like maps, tables, graphs, bars, spiders, and infographics (see Figure 3). Clicking on a theme (e.g., 'Biomass availability and Land use') brings the user automatically to tiles with indicators that are connected to the selected theme. There is flexibility in adding more tiles or reducing tiles with indicators.

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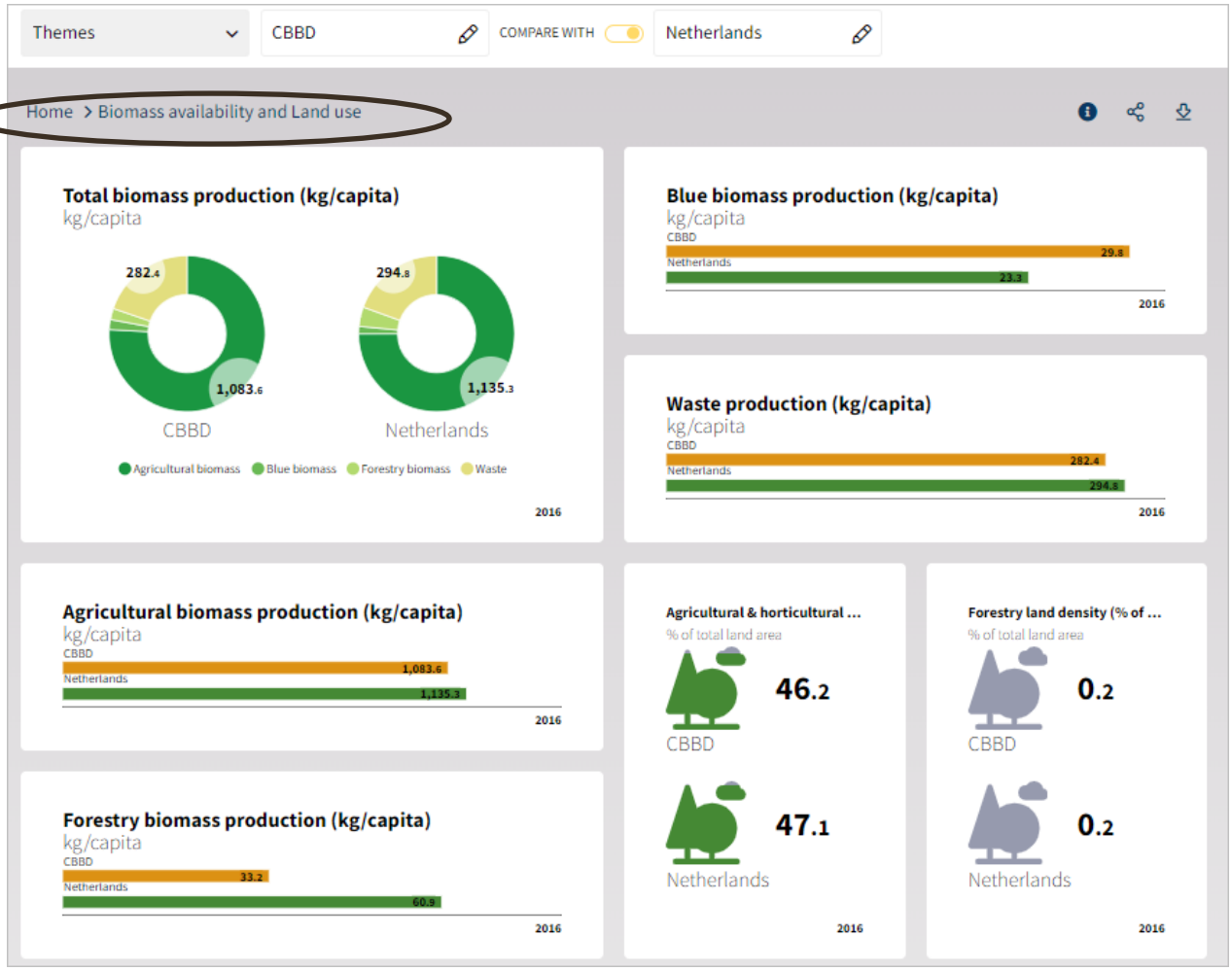

Figure 3 Indicators with visualisation options that below to the 'Biomass availability and Land use' theme

The external (public) user has online access to the dashboard via the link and can produce and analyse the mosaic of themes and indicators by selecting a region of interest. Assessments of a specific user are stored in the cache; thus his/her specific choices are still available a next time.

Further, it is possible to compare indicators of the region of interest with any other region, of course as long as data for the indicators have been collected and implemented in the dashboard. The example in Figure 3 shows that indicator values of 'Circular BioBased Delta region' (CBBD that consists of three NUTS2 regions Zeeland, Noord-Brabant and Zuid-Holland) are compared with indicator values of the Netherlands as a whole (Figure 4).

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Figure 4 Selection of region to analyse and comparison region

By clicking on the first pencil, the user can choose another region of interest, e.g., Dytiki Makedonia (Figure 5). By clicking on the second pencil, the user can choose a comparison region from the same country, e.g., Peloponnisos (Figure 6)

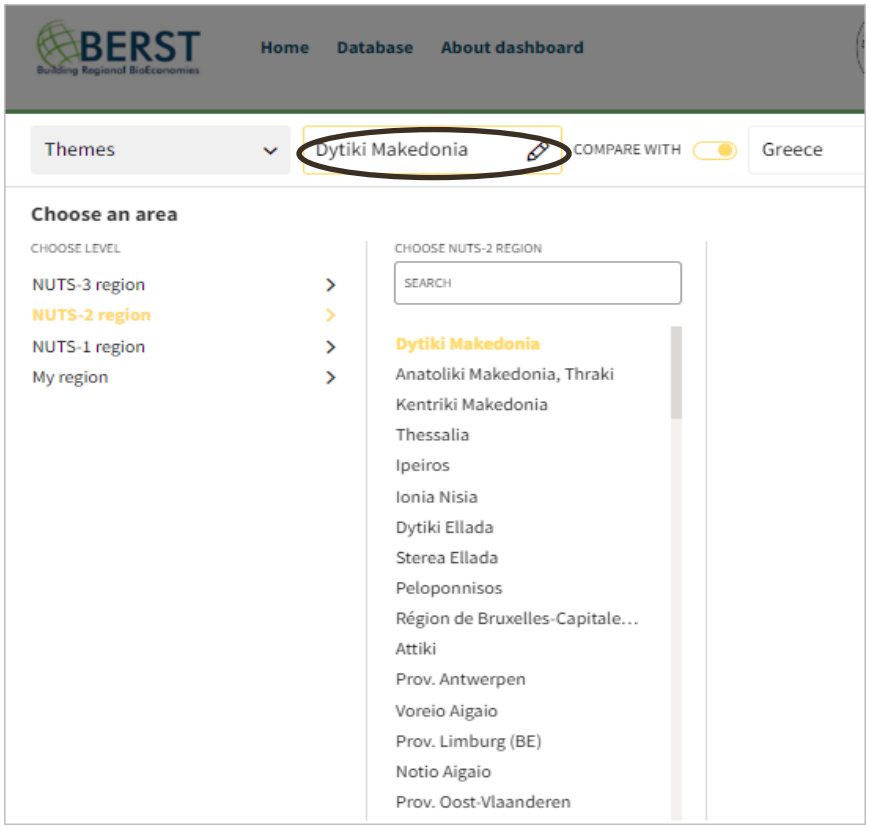

Figure 5 Choose a region of interest

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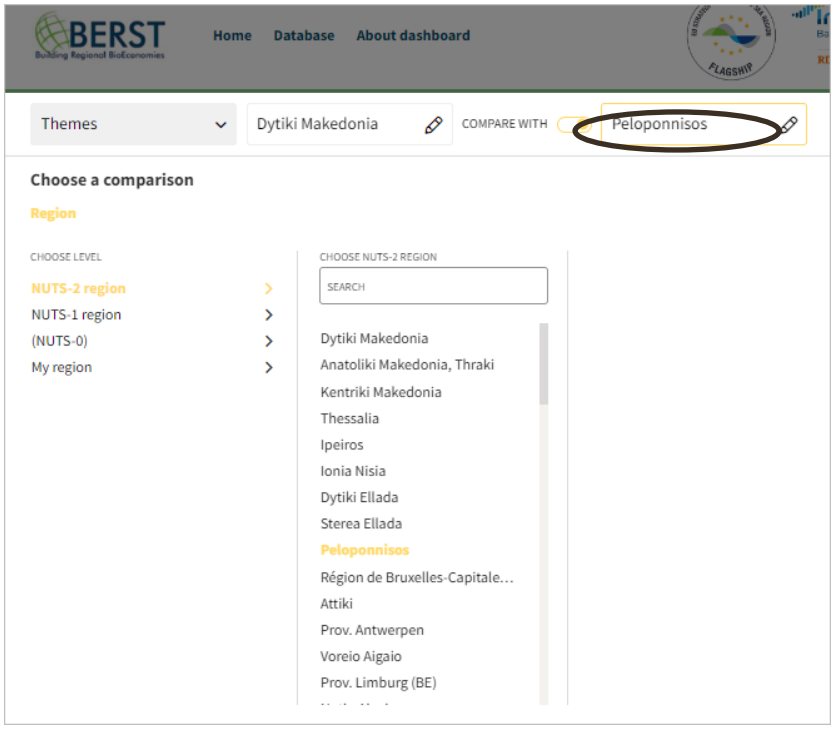

Figure 6 Choose a comparison region

If the user doesn't want to compare a region, the comparison option can be deactivated via the sliding panel (Figure 7). The dashboard now shows the results for Dytiki Makedonia only.

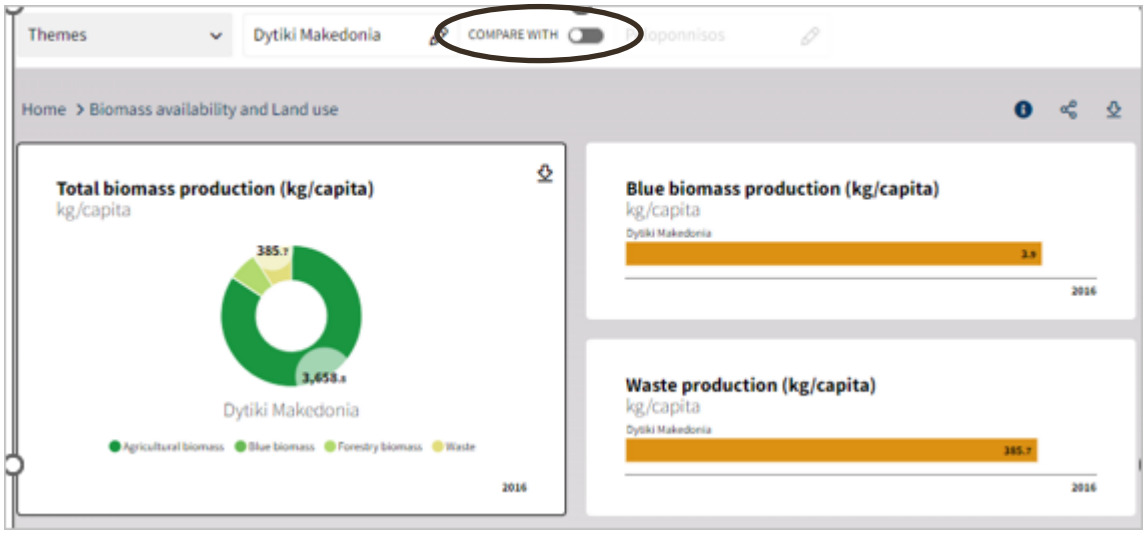

Figure 7 Infographics shown for a specific region (no comparison)

Another feature is that produced tables, graphs, infographics and maps can be downloaded as PDF, Excel, CSV or PNG files. Also, these can be shown with additional options, be shared via social media or be saved as weblink (Figure 8).

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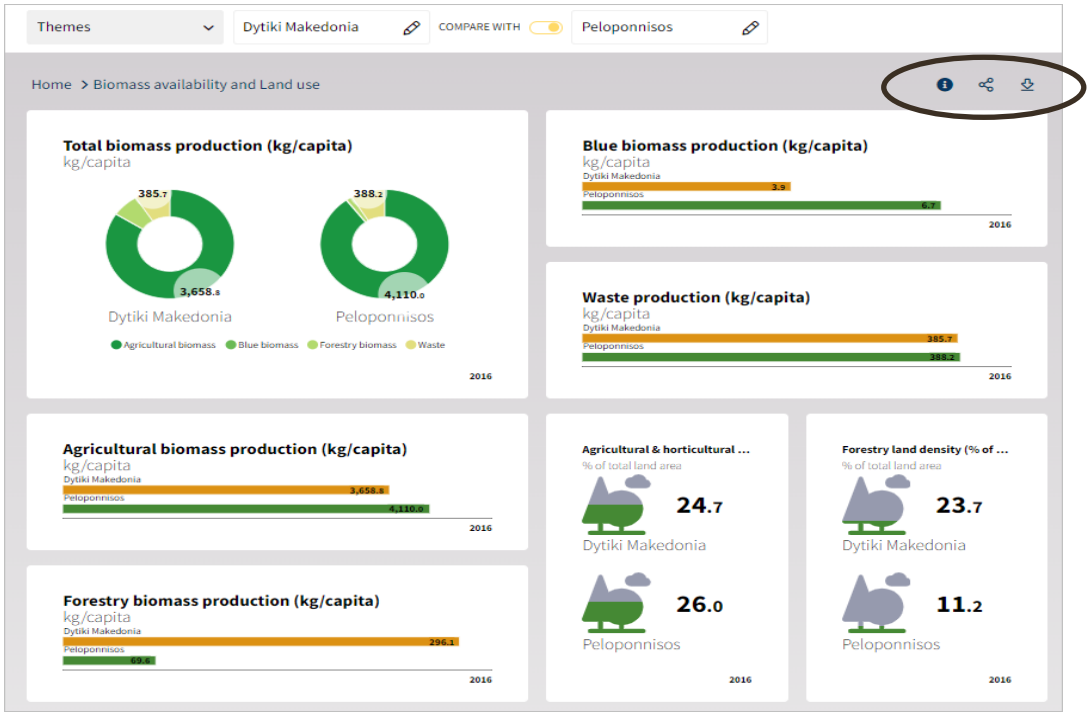

Figure 8 Sharing and download options

Finally, the dashboard has a storytelling function that summarizes the key findings of the governance model structure of a specific region in the form of a dynamic factsheet or report that contains some interesting figures and explaining text (Figure 9). Such regional reports can be downloaded as pdf.

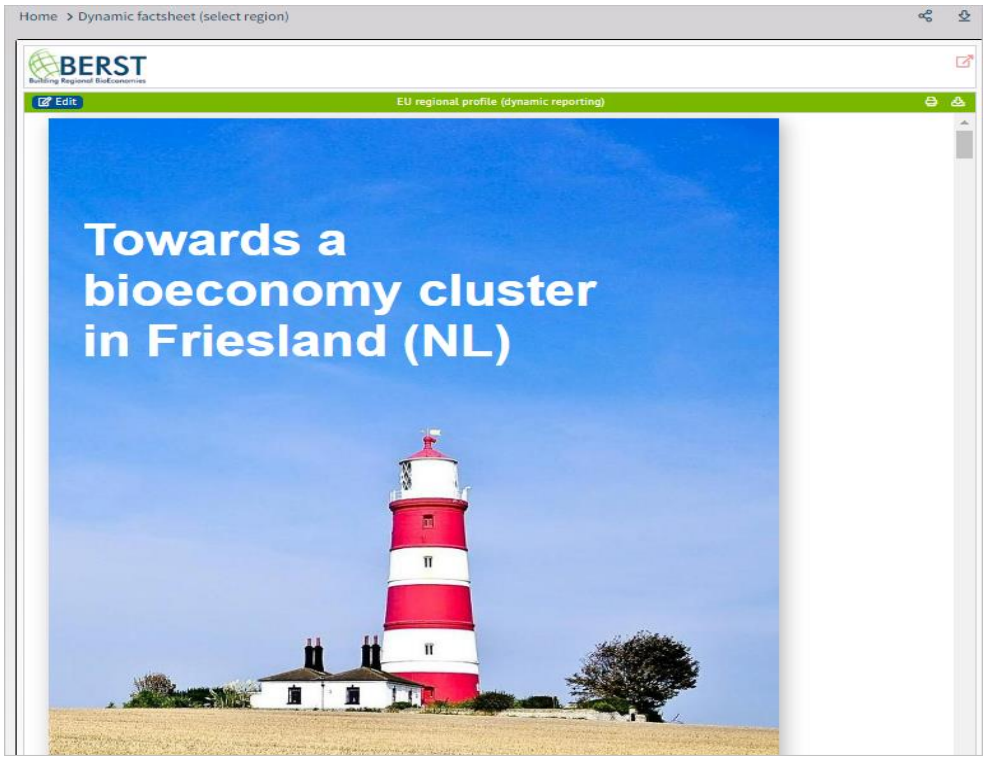

Figure 9 Dynamic report for Friesland region in the Netherlands

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3.3. AREAS AND INDICATORS IN BERST GOVERNANCE DASHBOARD (PRELIMINARY)

The BIOMODEL4REGIONS project aims to monitor and analyse governance indicators by applying a dashboard that supports policy recommendation. This is work in progress. This section highlights the contours of the beta BERST governance dashboard (Figure 10). It has been set up conform the 3 tiers of the governance framework in Figure 1. Note that styles (infographics, colours, etc) will be adapted according to the project's house style in the course of the project.

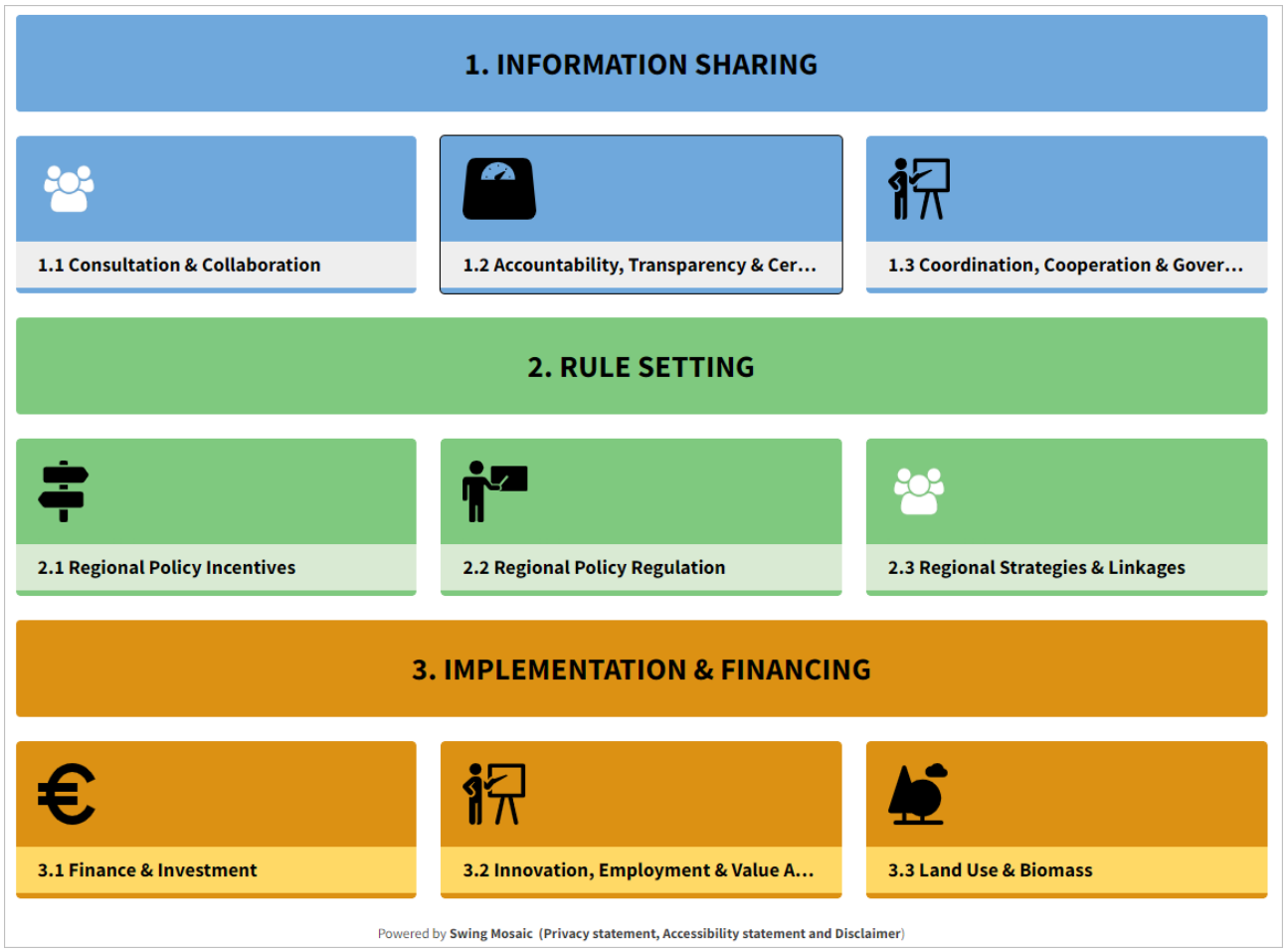

Figure 10 Opening screen of the beta BERST governance dashboard

The three broad horizonal boxes (text tiles) represent the 1st tier of the governance framework (see Figure 1), i.e., '1. INFORMATION SHARING', '2. RULE SETTING' and '3. IMPLEMENTATION & FINANCING'. Each 1st tier contains three governance areas (the 2nd tier of Figure 1). For example, '3.1 Finance & Investment', '3.2 Innovation, Employment & Value Added', and '3.3. Land Use & Biomass' belong to the 2nd tier of '3. IMPLEMENTATION & FINANCING'. By clicking on a 2nd tier tile, e.g., '3.3. Land Use & Biomass' (Figure 10), the user enters two tiles with sub-assessment criteria types, i.e. '3.3.1 Biomass types', and '3.3.2 Land use types' (Figure 11).

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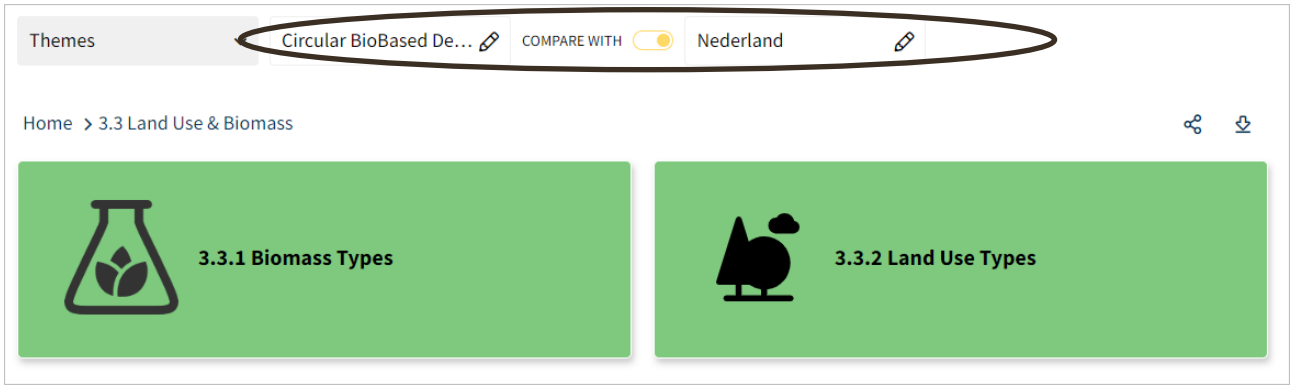

Figure 11 Tiles with sub-assessment criteria under the 2nd tier "3.3. Land Use & Biomass'

Next, by clicking on '3.3.2 Land use types' in Figure 11, the user enters the 3rd tier of the governance framework (Figure 1), which contain indicators related to 'Biomass types', and 'Land use types' respectively (Figure 12).

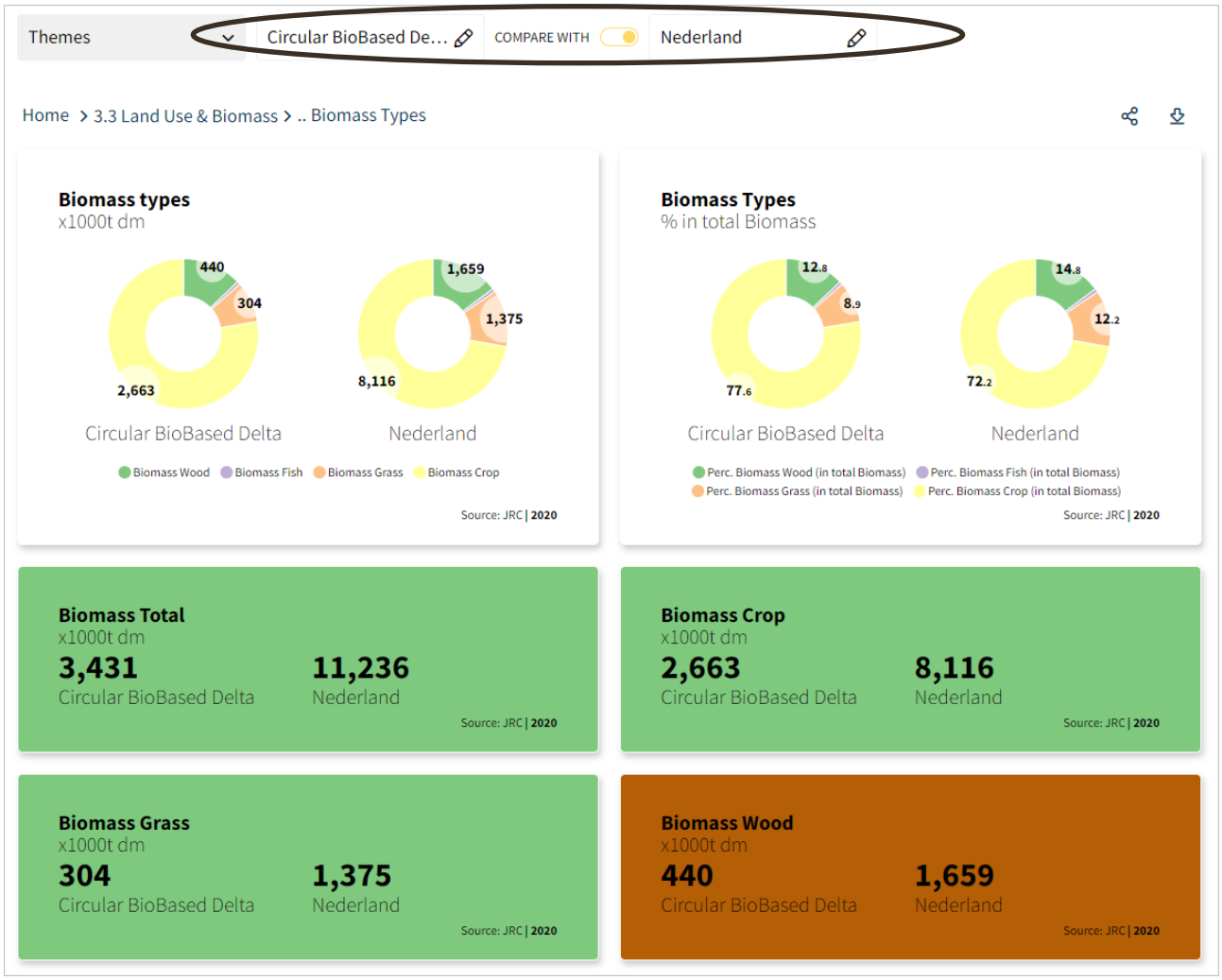

Figure 12 Biomass Types indicators with data for the Circular Biobased Delta region and the Netherlands

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In this example the indicator values are reported for the CBBD pilot region in the BIOMODEL4REGIONS project, which are compared with values for the Netherlands. On top of the screen the user can select another region (and/or another comparison region) at NUTS0, NUTS2 or EU27 levels (see description of features in section 3.2).

In this stage of the project, the software system only contains the profile indicators assigned to '3.2 Innovation, Employment & Value Added', and '3.3. Land Use & Biomass', which have been collectively collected from public sources (mostly Eurostat, EC-JRC). The selection and integration of specific governance indicators that originate from knowledge of regional stakeholders is work in progress and not implemented yet in the dashboard system.

3.4 SELF-ASSESSMENT OF EXTERNAL REGIONS

The BERST governance dashboard is being populated with two sort of indicators:

- Indicators compiled from public data sources (especially Eurostat, EC-JRC), most of them are already visualised in the beta version of the BERST dashboard.
- Indicators compiled from regional stakeholders. These data have been gathered in the BIOMODEL4REGIONS project for 6 pilot regions.

In combination the indicators give insight in the status quo of the governance framework of the 6 pilot regions. This status quo forms the base for a self-assessment analysis. The objective of this self-assessment is to identify which aspects of governance framework perform well in a region, and which ones could be improved. In order to understand whether the obtained values indicate a 'good', 'poor' or 'medium' performance, benchmarks will be added to the framework which will allow scoring of specific assessment criteria (3rd tier) or bioeconomy governance functions (2nd tier). The benchmarks will be created using literature reviews, project reports and studies as well as expert judgement.

As stated in Section 2, the benchmark option still needs to be developed and applied to the test case in the BIOMODEL4REGIONS project. The option will be explained in the updated version of this deliverable.

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ANNEX I GOVERNANCE KEY PERFORMANCE INDICATORS

Table A1-1 Governance KPIs selected to characterize the governance model of pilot regions

Governance field	Assessment criteria	Indicator
1.1 Consultation, collaboration, information flows across groups	1.1.1 Degree of collaboration & consultation	Presence of cluster organisation; industrial networks/PPP; collaboration with universities or research, H2020/CBI-JU/HORIZON, macro-regional projects; companies in bioeconomy cluster; biocluster integrated in science park
	1.1.2 Public support & acceptance	Campaigns/events to raise awareness on bioeconomy; public support and acceptance
1.2 Accountability, transparency, certification and award schemes	1.2.1 Monitoring and reporting	Monitoring and reporting on the bio-based economy
	1.2.2 Certification and sustainability labels on BPPS	Certification and sustainability labels on BPPS in place
	1.2.3 Sustainability management structures	Certification and labels explaining footprints of BBPs; Share of companies with sustainability credentials
1.3 Coordination, cooperation & multi-level governance	1.3.1 Multi-level collaboration (vertical)	Existence of Inter-ministerial cooperation to develop bioeconomy; Intensity of inter-ministerial forums
	1.3.2 Interregional cooperation (horizontal)	Existence of Interregional cooperation to develop bioeconomy; Intensity of interregional forums; Existence of dedicated administrative department to develop the bioeconomy
2.1 Regional policy incentives	2.1.1 Public procurements for BBPs	Bio-based public procurement policy; Tenders with bio-based requirements in procurement
	2.1.2 Taxes or subsidies supporting demand for BBPs	Policy incentives (tax, subsidies) supporting demand of bio-based products
2.2 Regional policy regulation	2.2.1 International laws and regulations (in support/obstacles)	Binding international laws & regulations (supporting bio-based economy) – qualitative description; Successful transposition of European laws and regulations that link to bio-based economy.
	2.2.2 Trade policies (in support/obstacles)	Trade policies (supporting bio-based economy); Trade policies (obstacles for bio-based economy)
	2.2.3 Other policies (in support/obstacles)	Trade policies (supporting bio-based economy); Trade policies (obstacles for bio-based economy); Policy regulations in place (supporting bio-based economy); Policy regulations in place (obstacles for bio-based economy) Policy regulations in place (supporting supply of bio-based economy); Policy regulations in place (obstacles for bio-based economy)

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2.3 Regional strategy and regional linkages	2.3.1 Strategies with bioeconomy focus	Dedicated regional bioeconomy strategies
	2.3.2 Degree of complementary with other sustainability topics	Regional strategies with links to bioeconomy and bio-based economy
	2.3.3 Policy commitment	Number of government departments and agencies involved in bioeconomy strategy roll-out/implementation; Policy commitment to bioeconomy and bio-based economy strategy implementation through in media
3.1 Finance & investment	3.1.1 Funding for bio-based companies	Access to private funds used by the biobased companies; Access to public funds used by the biobased companies
	3.1.2 Availability of private/public funding	Availability of private funding; Availability of public funding
3.2 Innovation, employment & value added	3.2.1 SME landscape and birth rate	Bio-based SME birth rate; Presence of incubator
	3.2.2 Employment structure	Total regional employment; total employment of total regional industry; total bio-based industry employment Total regional companies; total companies in total regional industry; total biobased companies
	3.2.3 Value Added	Bio-based value added specific by sector; Share value added of the selected bio-based sector in the overall regional bio-based economy; Share value added of the selected bio-based sector in regional industry (fb and bb)
	3.2.4 Sustainable management practices	Regional guidance on sustainability practices for bio-based economy sector; Carbon food print/Certification scheme; GHG emissions per selected sector
	3.2.5 Innovation potential	R&D expenditure; Pilot and Demonstration facilities; Intellectual property rights
	3.2.6 Market accessibility	Level playing field; Licensing new permits indirectly linked to BBPs (e.g. building permits etc.); Licensing new permits directly linked to BBP; Existence of good practices for developing regional bioeconomy
	3.2.7 Ownership & gender balance	Share of cooperatives; Share of female led business of total businesses in biobased-economy
	3.2.8 Future workforce	Pre-school education programs; Primary education programs; Secondary education programs; Tertiary education programs; Number of vocational programmes on bio-based economy; Presence of human capital agenda

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3.3 Biomass & land use availability	3.3.1 Local biomass production	Agricultural biomass production; Blue biomass production; Forestry biomass production; Waste production; Biomass gap; Presence of continuous supply of biomass with constant quality; Resource (incl. water and soil) and energy efficiency practices
	3.3.2 Land use patterns	Land-use change; forestry land density; agricultural & horticultural land density; total forestry land; total agricultural & horticultural land; GHG emissions per sector

Annex 2 gives a complete overview of the selected governance indicators in terms of definition, metrics, data source, geographic and temporal scope, and position in the governance model framework.

ANNEX 2 META INFORMATION ON GOVERNANCE INDICATORS

This annex gives insight in meta information about the governance indicators: name of the indicator, how it is constructed, how it is measured (metrics), and where the information comes from. Note that a tick in the last 2 columns means that data for the indicator is already available from other sources, such as Eurostat.

Note that it is the responsibility of BIOMODEL4REGIONS pilot regions, or for any region in general, in gathering data at the geographical and sectoral levels in case regular statistical sources (such as Eurostat) don't provide figures, e.g., by obtaining the data from regional sources, stakeholder interviews, or – in the exceptional stage – by making guestimates.

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Table A1-1 Meta information on governance indicators to be collected

Indicator name	Description and/or construction of indicator	Unit	Source	Data availability	
				NUTS0	NUS2
Degree of collaboration & consultation (1.1.1)					
Presence of cluster organisation	Indicates of a cluster organisation exists in the regional and sectoral scope of the pilot region	yes/no	Partner knowledge		
Share of Industrial networks/PPP	Biobased companies in industrial network / total bio-based companies in the pilot region	%	Partner knowledge		
Share of collaboration with universities or research	Research institutes collaborating with cluster / total number of research institutes in pilot region	%	Partner knowledge		
Collaboration with H2020/CBI-JU/HORIZON,	Indicates the number of projects related to the bioeconomy with macro/interregional scope and involvement (i.e., involving more than one nuts2 region in the country)	number	Partner knowledge		
Collaboration with macro-regional projects	Indicates the number of on-going European projects related to the bioeconomy in specified year and related to the regional and sectoral scope of the pilot region	number	Partner knowledge		
Companies in bioeconomy cluster	Companies in bioeconomy cluster	number	Eurostat; biobased shares; partner knowledge		
All regional companies		number	Eurostat	√	√
Share of companies in regional bioeconomy cluster in total regional companies	Companies in bioeconomy cluster / all regional companies	%	Eurostat; Partner knowledge		
Biocluster integrated in science park	Identifies if biocluster is connected to a science park and the diversity of business linked to it, e.g. (mix of)private companies, R&D centres, technical institutes, universities	number	Partner knowledge		
Public support & acceptance (1.1.2)					
Campaigns/events to raise awareness on bioeconomy;	Number of awareness raising activities related to the bioeconomy	number	Partner knowledge		
Campaigns/events to raise awareness on all regional activities	Number of awareness raising activities related to regional activities in general	number	Partner knowledge		

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Share of bioeconomy campaigns	Number of awareness raising related to bioeconomy / number of awareness raising campaigns related to regional industry	%	Partner knowledge		
Public support and acceptance	Represents a subjective self-assessment to grade the received degree of public acceptance towards bio-based products I the pilot region. This might not in all cased be distinguishable from support to bioeconomy in a wider sense	Very high/high/medium/low/very low/none	Partner knowledge		
Monitoring and reporting (1.2.1)					
Monitoring and reporting on the bio-based economy in place	Identifies whether or not a monitoring system are in place at the regional level to monitor and evaluate the implementation/performance of the bio-based economy	Absent/considered/in preparation/published/revised	Partner knowledge		
Certification and sustainability labels on BBPs (1.2.2)					
Certification and sustainability labels on bio-based products in place	Certifications and labels with focus on carbon footprints of bio-based products	number	Partner knowledge		
Sustainability management structures (1.2.3)					
Certification and labels explaining footprints of bio-based products	Share of certification and labels with focus on carbon footprints of bio-based products	%	Partner knowledge		
Share of certification and sustainability labels on BPPS in place	Share of bio-based companies within regional and sectoral scope of the pilot region that have sustainability credentials (EMAS or similar). Biobased companies with credentials / total bio-based companies	%	Partner knowledge		
Multi-level collaboration (vertical) (1.3.1)					
Intensity of inter-ministerial forums	Number of inter-ministerial forums in the pilot region	Number	Partner knowledge		
Interregional cooperation (horizontal) (1.3.2)					
Existence of inter-regional cooperation to develop bioeconomy	Identification of the type of established forums along the proposed typology	In place/absent	Partner knowledge		
Intensity of inter-ministerial cooperation to develop bioeconomy	Number of inter-regional forums in the pilot region	Number	Partner knowledge		

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Public procurements for BBPs (2.1.1)					
Biobased public procurement policy	Public procurement can support the market take-up of new products. Measures if bio-based public procurement policy is in place	Absent/considered/in preparation/published/revised	Partner knowledge		
Tenders with bio-based requirements in procurement	Tenders with bio-based requirements in procurement beyond existing levels (tender or contract) including description of requirement)	Mio euro	Partner knowledge		
Taxes or subsidies supporting demand for BBPs (2.1.2)					
Policy incentives (tax, subsidies) supporting demand of bio-based products	Measures if demand for bio-based products is promoted through financial instruments on national/regional level	Absent/considered/in preparation/published/revised	Partner knowledge		
International laws and regulations (in support/obstacles) (2.2.1)					
Binding international laws & regulations (supporting bio-based economy)	Qualitative description that lists the English title (including reference, numbers, etc) of the policy document as well as a short description of why it is supporting the bio-based economy in the region	Qualitative description	Partner knowledge		
Binding international laws & regulations (supporting bio-based economy)	Identifies to which degree international laws and regulations positively influence the development on the regional bioeconomy.	Very high/high/medium/low/very low/none	Partner knowledge		
Binding international laws & regulations (obstacle for bio-based economy)	Qualitative description that list the English title (including reference, numbers, etc) of the policy document as well as a short description of why it is hindering the bio-based economy in the region	Qualitative description	Partner knowledge		
Binding international laws & regulations (obstacle for bio-based economy)	Identifies to which degree international laws and regulations negatively influence the development on the regional bioeconomy.	Very high/high/medium/low/very low/none	Partner knowledge		
Successful transposition of European laws and regulations that link to bio-based economy	Measures how successful EU laws that impact on the bio-based economy are being transposed within the country/region	Very high/high/medium/low/very low/none	Partner knowledge		

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Trade policies (in support/obstacles) (2.2.2)					
Trade policies (supporting bio-based economy)	As a specific type of international law might support the development of the bio-based economy. E.g., if biomass need to be imported or the biobased product is primarily of interest in the international market	Very high/high/medium/low/very low/none	Partner knowledge		
Trade policies (obstacle bio-based economy)	As a specific type of international law might hinder the development of the bio-based economy. E.g., if biomass need to be imported or the biobased product is primarily of interest in the international market	Very high/high/medium/low/very low/none	Partner knowledge		
Other policies (in support/obstacles) (2.2.3)					
Trade policies (supporting bio-based economy)	Qualitative description that lists the English title (including reference, numbers, etc) of the policy document as well as a short description of why it is supporting the bio-based economy in the region	Qualitative description	Partner knowledge		
Trade policies (obstacle bio-based economy)	Qualitative description that lists the English title (including reference, numbers, etc) of the policy document as well as a short description of why it is hindering the bio-based economy in the region	Qualitative description	Partner knowledge		
Policy regulations in place (supporting bio-based economy)	National, regional or European policies that support the development of the bio-based economy (e.g., supply or processing)	Very high/high/medium/low/very low/none	Partner knowledge		
Policy regulations in place (obstacle for bio-based economy)	National, regional or European policies that hinder the development of the bio-based economy (e.g., supply or processing)	Very high/high/medium/low/very low/none	Partner knowledge		
Policy regulations in place (supporting bio-based economy)	Qualitative description that lists the English title (including reference, numbers, etc) of the policy document as well as a short description of why it is supporting the bio-based economy in the region	Qualitative description	Partner knowledge		
Policy regulations in place (obstacle for bio-based economy)	Qualitative description that lists the English title (including reference, numbers, etc) of the policy document as well as a short description of why it is hindering the bio-based economy in the region	Qualitative description	Partner knowledge		
Strategies with bioeconomy focus (2.3.1)					

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Dedicated regional bioeconomy strategies	Regional bioeconomy strategies are in many cases strongly interlined with bio-based economy. Indicators measures if these strategies are in place	Absent/considered/in preparation/published/revised	Partner knowledge		
Degree of complementary with other sustainability topics (2.3.2)					
Regional strategies with links to bioeconomy and bio-based economy	Quantifies all regional policies, strategies and instruments that link to goals of the bioeconomy	Number	Partner knowledge		
Policy commitment (2.3.3)					
Government departments and agencies involved in bioeconomy strategy roll-out/implementation	Measures all regional government departments, or related agencies that are involved in the development and/or roll-out /implementation of the bioeconomy	Number	Partner knowledge		
Policy commitment to bioeconomy and bio-based economy strategy implementation through media	Quantifies the different channels information on the bio-based economy was shared. It may include a variety of channels (social media, newspaper etc) and stakeholders by policy makers and institutions (governmental agencies, ministries, etc)	Very high/high/medium/low/very low/none	Partner knowledge		
Funding for bio-based companies (3.1.1)					
Access to private funds used by bio-based companies	Funding opportunities will support the establishment of bio-based companies. Measures qualitatively the access to private funding in the specific sectoral and regional focus of the pilot region	Very high/high/medium/low/very low/none	Partner knowledge		
Access to public funds used by bio-based companies	Funding opportunities will support the establishment of bio-based companies. Measures qualitatively the access to public funding in the specific sectoral and regional focus of the pilot region	Very high/high/medium/low/very low/none	Partner knowledge		
Availability of private/public funding (3.1.2)					
Availability of private funding	Funding opportunities will support the establishment of bio-based companies. Measures quantitatively the access to private funding in the specific sectoral and regional focus of the pilot region	Mio euros	Partner knowledge		
Availability of public funding	Funding opportunities will support the establishment of bio-based companies. Measures qualitatively the access to	Mio euros	Partner knowledge		

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	quantitatively funding in the specific sectoral and regional focus of the pilot region				
SME landscape and birth rate (3.2.1)					
Share of Bio-based SME birth rate	(Biobased companies in year t – biobased companies in year t-1))/(biobased companies in year t-1)*100	% (share)	Regional business demography; chamber of commerce		
Presence of incubator	Incubators may support the link between innovation to market. Indicator measures if an incubator exists and it is actively promoting the bio-based economy	Yes/no	Partner knowledge		
Employment structure (3.2.2)					
Total employment in regional bio-based economy sectors	It respects the workforce in the sectoral focus in the pilot region	Employed persons	SBS; biobased shares in industry (expert)	√	√
Value Added (3.2.3)					
Total value added in regional bio-based economy sectors	It respects the value added in the sectoral focus in the pilot region	Mio euros	SBS; biobased shares in industry (expert)	√	√
Share of value added in selected bio-based sectors in the overall regional bio-based economy	Total value added in selected bio-based sectors in pilot region / total value added of the total bio-based industry in pilot region	%	SBS; biobased shares in industry (expert)		
Share of value added of the selected bio-based sector in total regional industry	Total value added in selected bio-based sectors in pilot region / total value added of total industry in pilot region	%	SBS; biobased shares in industry (expert)		
Sustainable management practices (3.2.4)					
Regional guidance on sustainability practices for bio-based economy sector	Implementation of governance along ecological, economic and social criteria can measure the existence of regional guidance, support schemes, etc	Absent/considered/in preparation/published/revised	Partner knowledge		
Carbon footprint/certification scheme	Measures the aggregated data on the regional and sectoral scope in pilot region	Carbon footprint??	Partner knowledge		

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Greenhouse gases in the regional bio-based sector	Indicates the CO2 emissions in the sectoral and regional focus of the pilot region	Tonnes CO2eq	Eurostat	√	√?
Innovation potential (3.2.5)					
R&D expenditure	Indicates the general innovation landscape and hint at favouring or limiting conditions	Mio euro	Regional Innovation Scoreboard; Innovation Union Scoreboard; Chamber of Commerce	√	√?
Pilot and Demonstration facilities	Represent bridges between generating basic knowledge and technological breakthroughs, and industrial applications and commercial adoption. Estimates the number of pilots and demonstration facilities in the pilot region	Absent/considered/in preparation/published/revised	Regional Innovation Scoreboard; Innovation Union Scoreboard; Chamber of Commerce	√	√?
Intellectual property rights	Patented regional bio-based products gives indication on the innovation of the market	Number	Regional Innovation Scoreboard; Innovation Union Scoreboard; Chamber of Commerce	√	√?
Market accessibility (3.2.6)					
Level playing field	Measures if bioeconomy is equally supported as the fossil-based economy by the institutions	Very high/high/medium/low/very low/none	Regional Innovation Scoreboard; Innovation Union Scoreboard; Chamber of Commerce		
Licensing new permits indirectly linked to bio-based products (e.g., building permits etc)	Indication of bureaucracy burden, given by qualitative description on the process of permits indirectly linked to bio-based products	Very high/high/medium/low/very low/none	Partner knowledge		

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Existence of good practices for developing regional bioeconomy	Indication that good practices are helpful to develop bioeconomy in the region	Yes/no	Partner knowledge		
Ownership & gender balance (3.2.7)					
Share of cooperatives	Number of biobased cooperatives / total number of biobased companies	% of total business	Chamber of Commerce	v	√?
Share of female led business in total bioeconomy businesses	Number of biobased companies led by females / total number of biobased companies in the region	% of total business	Chamber of Commerce	v	√?
Future workforce (3.2.8)					
Pre-school education programs	Programmes include in the curriculum that inform and teach on bioeconomy and bio-based economy	Number	National/regional statistics	v	√?
Primary education programs	Programmes include in the curriculum that inform and teach on bioeconomy and bio-based economy	Number	National/regional statistics	v	√?
Secondary education programs	Programmes include in the curriculum that inform and teach on bioeconomy and bio-based economy	Number	National/regional statistics	v	√?
Tertiary education programs	Programmes include in the curriculum that inform and teach on bioeconomy and bio-based economy	Number	National/regional statistics	v	√?
Vocational programmes on bio-based economy	Reskilling and upskilling included in the curriculum that inform and teach on bioeconomy and bio-based economy	Number	National/regional statistics	v	√?
Presence of human capital agenda	Identifies and tackles the discrepancies in the labour market on demand and supply in personnel	Absent/considered/in preparation/published/revised	Partner knowledge		
Local biomass production (3.3.1)					
Agricultural biomass production	Linked to regional and sectoral focus in the pilot region	1000t dm	JRC (DataM)	√	
Blue biomass production	Linked to regional and sectoral focus in the pilot region	1000t dm	JRC (DataM)	√	
Forestry biomass production	Linked to regional and sectoral focus in the pilot region	1000t dm	JRC (DataM)	√	
Waste production	Linked to regional and sectoral focus in the pilot region	1000 m3?			
Biomass gap	Indicates if there is sufficient biomass available to fulfil the demand for biomass from the material industry	1000t dm	Own calculation	√	

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Presence of continuous supply of biomass with constant quality	Measures the continuity in deliveries of biomass of high quality to the regional bio-based industries	Yes/no	Partner knowledge		
Resource (inc. water and soil) and energy efficiency practices	Measures the use and implementation of resource efficiency in the regional bio-based economy	Very high/high/medium/low/very low/none	Partner knowledge		
Land use patterns (3.3.2)					
Land use change	Change in land-use patterns over time	Very high/high/medium/low/very low/none	Partner knowledge		
Total forestry land		Km2	Eurostat	v	√
Total agricultural and horticultural land		Km2	Eurostat	v	√
Forestry land density	Forestry land use / total land use	% of total land	Eurostat	v	√
Agricultural and horticultural land density	Agricultural and horticultural land use / total land use	% of total land	Eurostat	v	√

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ANNEX 3 DATA COLLECTION AT REGIONAL LEVEL

As each geographical region and economic sector have unique administrative codes, harmonisation and consistency of data on a specific indicator is guaranteed as long as data is regularly reported in public statistics (e.g., 'agricultural land use in region x', 'population in region x'). If data on a specific indicator is not available in statistics, which is mostly the case for qualitative indicators (e.g., 'availability of public funding in region x' or 'collaboration with universities or research in region x', 'collaboration in H2020/CBI-JU/HORIZON projects in region x'), the data should come from primary data collection methods (interviews, surveys, etc). Challenge is to get information about these qualitative indicators at the systems boundaries - determined geographical region(s) and economic sector(s) – of the studied regions. Therefore, before collecting data of the selected KPIs at the regional level, the geographical and sectoral scopes must be defined. Data collection for each indicator should fit to these boundaries in order to depict a balanced picture of the actual governance structure of a region. Note that a 'region' can cover more than one nuts region or more than one sector (NACE). For example, the boundaries of the 6 pilot regions in the BIOMODEL4REGIONS project are provided in Table A3-1.

Table A3-1 Geographical and sectoral scope (with statistical codes) in pilots

Region	geographical coverage (NUTS)	Sectoral coverage (NACE)
Delta Region Southwest (NL)	Zuid-Holland (NL33), Zeeland (NL34), Noord-Brabant (NL41)	Agriculture (A01), Forestry (A02), Fishery (A03), Manufacture of food products (C10), Manufacture of beverages (C11), Manufacture of tobacco products (C12), Manufacture of textiles (C13), Manufacture of chemicals & chemical products (C20), Manufacture of pharmaceutical products (C21), Manufacture of rubber and plastic products (C22), Manufacture of furniture (C31), Electricity, gas, steam and air conditioning supply (D), Waste collection, treatment and disposal activities, materials recovery (E38), Construction of buildings (F41), Specialized construction activities (F43)
Bioeconomy cluster (SK)	Západné Slovensko (SK02)	Waste collection, treatment and disposal activities, materials recovery (E38)
Biofuel region (SE)	Mellersta Norrland (SE32), Övre Norrland (SE33)	Forestry (A02), Manufacture of Paper and paper products (C17), Manufacture of pharmaceutical products (C21), Electricity, gas, steam and air conditioning supply (D)

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Aquimer region (FR)	Basse-Normandie (FRD1), Haute-Normandie (FRD2)	Fishery (A03), Manufacture of food products (C10), Manufacture of chemicals & chemical products (C20), Waste collection, treatment and disposal activities, materials recovery (E38), Construction of buildings (F41),
Spring region (IT)	Toscana (ITI10	Agriculture (A01), Forestry (A02), Fishery (A03), Manufacture of food products (C10), Manufacture of textiles (C13), Manufacture of wood and products of wood (C16), Manufacture of paper and paper products (C17), Manufacture of chemicals and chemical products (C20), Manufacture of rubber and plastic products (C22), Electricity, gas, steam and air conditioning supply (D), Waste collection, treatment and disposal activities, materials recovery (E38)
CLUBE region (GR)	Dytiki Makedonia (EL53)	Agriculture (A01), Forestry (A02), Manufacture of food products (C10), Manufacture of wood and products of wood (C16), Waste collection, treatment and disposal activities, materials recovery (E38)

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