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D3.1 - GENERIC MODEL FOR REGIONAL BIO-BASED ECONOMY GOVERNANCE

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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 by:

1. Supporting the development of regional/local strategies, aiming at exploiting the local potentials and innovations by integrating the opportunities created by the local bio-based economy thus contributing to the broader bio-based economy transition.
2. Developing novel business models to enable consumers, industry/producers and public bodies to a societal switch towards environmentally responsible behaviour by means of bio-based products and services.
3. Developing best practice guidelines for local operators and innovation developers, supporting climate-neutrality and low environmental footprint improvements of bio-based products and services.

Connected to Task 3.1, this deliverable (D3.1) will address and lay the groundwork for Objective 1 by taking a closer look at regional bio-based economy governance systems and related policies. In this, it will support the understanding of the governance structure among bio-based economy clusters, actors, stakeholders, and the policy landscape.

This task aims to develop a methodological approach for the analysis of the governance system and related policies in the six pilot regions, considering different model regions (Northern, Southern, Eastern and Central-Western EU), their conditions and assets and different primary sectors (forestry, agri-food, aquatic biomass and organic fraction of municipal solid waste- OFMSW):

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

This deliverable outlines the methodology that will serve the governance and policy analysis in the pilot regions (Task 3.3) and furthermore will enable benchmarking and the development of recommendations for an improved bio-based economy governance in the pilot regions and across Europe (Task 5.1). In order to ensure relevance and practice-orientedness, the draft methodology has been validated with stakeholders from the pilot regions through online focus group events, the outcomes of which are documented in the ANNEX of this deliverable.

The methodology has the potential to enable the development of governance recommendations which aid in ensuring bio-based economy governance promotes sustainability, in line with the function of the bio-based economy as identified by the European Commission; as a means “to reduce the 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). Sustainability is therefore a key

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consideration in the development of the methodology, to assist in enabling sustainable production of renewable resources and practises in order to reduce resource demand and its impacts, in line with the Sustainable Development Goals (SDGs).

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2 GOVERNANCE IN BIO-BASED ECONOMY

There is a growing focus on the bio-based economy at the European level in recent years with the initial roll out of the Bio-based economy Strategy (European Commission, 2012) and Bio-based economy Action Plan (European Commission, 2015). Both the strategy and action plan were updated in 2018, followed by the publishing of the EU Circular Economy Action Plan (CEAP) in 2020. The CEAP is one of the main building blocks of the European Green Deal and links with the Bio-based economy Action Plan (European Commission, 2018) in two key areas: in sustainable production, supporting the bio-based sector in its circularity potential, and in the area of food, nutrients and water, where it supports increased shares of extraction of sustainable biomass materials in the EU, building a sustainable circular bio-based economy. Furthermore, circularity and the bio-based economy link in a fundamental conceptual way when framing the circular economy as two cycles or spheres - one being the technological sphere where non-renewable resources are being circulated - the other being the biosphere where renewable materials are being extracted, used and fed back into the biosphere in a circular manner (see EllenMacArthur Foundation, 2014; Haas et al. 2015).

Apart from the core strategic framework for the bio-based economy (the 2018 EU Bio-based economy Strategy and Action Plan) and the CEAP, there are number of other Directives and Communiqués, which enable the bio-based economy across different sectors, i.e. on plastics (packaging and single-use), forestry, renewable energy, eco-design and waste. In the frame of the European Commission's (EC's) 'Lead Market Initiative' (COM (2007) 860) and based on an EC mandate, the European Committee for Standardization (CEN) has developed since 2008, standards related to bio-based products (non-food & feed and non-energy), technical reports and specifications in areas including common terminology (EN 16575), methods for determining bio-based content (CEN/TR 16721, CEN/TS 16640, EN 16785) and Life Cycle Assessment (EN 16760), all of which aid in enabling bio-based markets. Among other regulatory instruments for stimulating uptake of bio-based products, are local tax and incentive schemes such as pricing conventional plastics bags, or banning them altogether – however such measures are fragmented across EU Member States and common standards have yet to be developed.

Stakeholders at the local and regional level play an important role in the quadruple helix of actors (policy, research, industry and civil society) which enable the development of the bio-based economy. Promotion, facilitation and enabling of bio-based markets is in part carried out by local/regional authorities who follow a vision for a circular bio-based economy that fosters circular product design, promotes uptake of bio-based products and lifestyles among its citizens and aims at reducing, reusing and recycling of waste (OECD, 2019). When it comes to Bio-based economy governance actors, users of bio-based products, academia, scientific and technological institutions, businesses and representatives of sectoral associations and business intermediaries are all key stakeholders (BIOVOICES D.3.1, 2018). Biomass (feedstock) producers begin a biomass value chain by connecting with biomass pre-treaters (e.g. separation and sorting) and biomass processors (e.g. treatment of biomass) or biomass converters (e.g. biomass to energy). There are intermediate actors - "Bridge Organisations" - which can facilitate the development of these connections between actors and further enable joint innovation. A lack of specific bio-based bodies or networks in many regions was a gap identified in the project BIOEAST (2017). In addition, actors and groups that do not participate in the technical development of bio-based applications, such as citizens and brand-owners, are marginally involved in the transition towards a bio-based economy (BIOVOICES D3.3,

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2019). Groups such as citizens and brand-owners are mainly *informed* about the bio-based economy and play a minor role in facilitating, co-creating and financing bio-based applications (Overbeek et al., 2016; Gerdes et al., 2018). This is a missed opportunity as user involvement (business to business and business to consumer) is key to develop bio-based applications that are considered valuable and desirable, essential for crossing the 'valley of death' and achieving take-off and acceleration (Osterwalder & Pigneur, 2010; Rogers, 2003). In order to create a shift from a technical to a social innovation, and from a triple helix into a quadruple helix, it is important to consider the different stakeholders and their perspectives, i.e. civil society, businesses, policy makers, research and education (BIOVOICES D3.3, 2019). The need to overcome this gap can be determined to be vital. Thinktanks were also identified as important actors for progressing the many technologies that are still developing and for aiding collaboration between various sectors. Additional emergent players identified can include councils, thematic platforms and networks, specialised technology and research and innovation centres (Spatial Foresight et al., 2017). Building on this literature review of relevant actors, Deliverable 3.1 aims to develop a methodological approach which includes all relevant governance actors, validated by the six pilot regions, for the analysis of the governance systems and related policies.

It is noted that while developing the methodological approach in Deliverable 3.1, the following aspects are taken into consideration:

- Bio-based economy & bio-based products are terms unknown or less known by the large public; these terms are also frequently confused with other meanings (e.g., organic or biodegradable products, circular economy or sustainability). It is therefore suggested to use in discussion/contacts with stakeholders a 'glossary of bio-based economy', where the relevant terms are properly defined and explained, so that everyone obtains an equal understanding of the nomenclature used (BIOBRIDGES D6.2, 2020).
- Even if strongly promoted by policy makers, potential economic impacts of bio-based economy are not perceived by consumers (for instance, the possibility to create new jobs, the development of new technologies, etc.). Therefore, other potential benefits (in addition to the environmental ones), specifically addressing different potential targets, should be highlighted for instance:
    - Primary producers, in order to explain how valorise unexploited resources that could enable them to increase their incomes;
    - Policy makers, to stimulate them to boost the rural development through the definition of strategies and the investment of public resources (in particular, the ones coming from the European Regional Development Fund);
    - Unemployed people, to explain new possible opportunities;
    - Young generations, to guide them towards educational and career paths that could develop their skills for future jobs in the sector(BIOBRIDGES D6.2, 2020).
- Regional dimension of the bio-based economy should be strengthened. The second pillar of the 2018 EU Bio-based economy Strategy focuses on deploying local bioeconomies rapidly across Europe through supporting regions and EU Member States to develop bio-based economy strategies, among others. Accordingly, regional bio-based economy clusters, in which value chains and available expertise are concentrated in specific areas, are critical for the bio-based economy to succeed. Networking – which provides value added to SMEs – is essential for this purpose. Cross-sectoral get-togethers, for example a factory tour, can be an effective instrument for bringing actors together and planning joint activities. The focus should be on

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identifying, communicating and fostering concrete synergies between different actors in regional bio-based economy clusters, since it helps making the latter more attractive (BIOBRIDGES D5.4, 2020).

Considering governance collaboration in the EU on the bio-based economy across multiple levels, It was determined as part of findings in the Biovoices (2018) project that a multi-level governance framework (i.e. coherent policy, research, implementation and monitoring) at local, regional, national and European level has yet to be developed or expanded regarding the bio-based economy and hence the horizontal integration between ministries and departments relevant to the bio-based economy is mostly absent. This poses a major barrier to the implementation of the bio-based economy and calls for the horizontal integration of the bio-based economy into other ministerial and municipal departments both top-down, e.g. through administrative reforms, and bottom-up, e.g. through leading by example and inspiration. Building on this there is also an insufficient connection between the bio-based economy and other major policy agendas at EU level (e.g. sustainable development, circular economy and climate neutrality), calling for stronger alignment and exploitation of complementary policies. The development of the governance analysis methodology in Deliverable 3.1 forms the basis of providing recommendations to address these governance challenges (among others).

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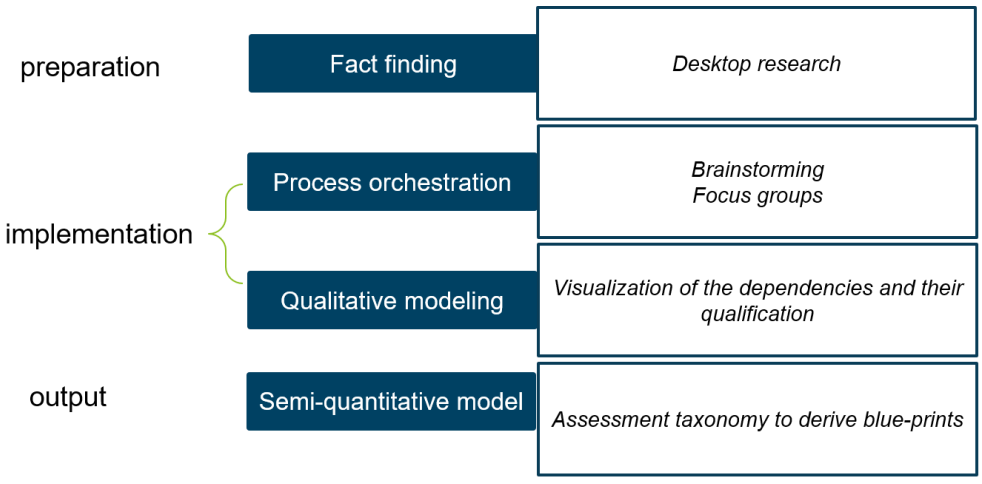
3 GENERAL APPROACH

Based on a 'virtual region' approach, a generic governance analysis model (forthwith referred to as *the model*) is developed outlining functions, roles and opportunities of different entities within a virtual regional government (horizontal), including non-state actors, and exemplary policy instruments, as well as among different levels of government, i.e. local, national and EU (vertical). With reference to the 'virtual city' discourse, the 'virtual region approach' is chosen for the development of the generic version of the governance model, addressing bio-based economy governance from a perspective of an abstract, *virtual* region in order to derive generalizable actor groups and interaction between them that can be specified and tailored to different local contexts. The governance model shall help to better understand the actor network and its interactions, identify the enablers, barriers and challenges and to ultimately support and strengthen the vertical and horizontal multi-level governance dialogue to create a sustainable and future oriented bio-based economy across Europe.

Thus, the model, with its virtual region approach, is 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 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).

The development work has been carried out through desk research reviewing selected literature on local sustainability governance as well as own expert knowledge. 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 WP2, although noting that the approach and definition of 'governance' differs substantially, considering the rather focused notion of 'governing the project pilot' in WP2 and 'governing the bio-based economy transition in the region' in WP3.



Source: adapted Videira et al. 2010, Voinov et al. 2018

To further advance the methodology development based on initial desktop research and process design, a 'participatory modelling' approach was selected. Participatory modelling is

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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, was to validate what had already been developed as well as to co-create parts of the methodology. The workflow and process can be summarised as follows:

The work is based on a preliminary desk research designing an approximate representation of a generic governance model.

1. Definition of the basic use of the model, considering demands toward the analysis and utilisation of results.
2. Literature review through desktop work.
3. Definition of basic governance functions, including the multi-level actors’ landscape and functional relationships between them.
4. Validation and co-creation through 5 focus group events with stakeholders from the pilot regions of Normandy, Tuscany, Biofuel Cluster Sweden, Delta Region Netherlands and Western Macedonia; as well as through an online questionnaire to the Slovakian Cluster.
5. Consolidation of results from the focus groups to finalise the model as well as to develop information sheets on each pilot region on their bio-based economy governance on the ground, which will be used also to further tailor the methodology and apply the model within Task 3.3, starting January 2023.
6. Complementing the methodology, using the results and experiences from the Biobridges and BIOVOICES projects, particularly the stakeholder work on barriers and opportunities.

The focus group events formed an integral part of the work process within Task 3.1, both in terms of generating essential content for the method development and its further application and analysis as well as in terms of engaging key stakeholders, building the relationship necessary to work together for the duration of the project and beyond.

TABLE 1: SCHEDULE OF THE VALIDATION FOCUS GROUPS AND SURVEYS WITH THE PILOT REGIONS

Pilot Region	Focus Group (FG) / Surveys (S)
Normandy, France	FG 7th November 2022
Western Macedonia, Greece	FG 10th November 2022
Tuscany, Italy	FG 14th November 2022
Slovakia	S 16th November, response received on the 25th November.

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Pilot Region	Focus Group (FG) / Surveys (S)
Normandy, France	FG 7th November 2022
Delta Region, The Netherlands	FG 21th November 2022
Sweden	FG 29th November 2022

The focus groups followed a standardised approach in which the partners and stakeholders were introduced. Short presentations on the methodology as well as on facts about the pilot region followed. In an interactive format the governance functions and model element were appraised. Finally, the status of the qualitative model was shared.

For each focus group event, the regional cluster partner was asked to provide a basic outline of current bio-based economy governance set-ups and practices in the regions. The approach to validating the methodology was adapted further with each focus group to better engage stakeholders. Given feedback allowed an understanding that posing questions to the stakeholders worked better to encourage participation as compared to presenting them with the draft model outright. The suitability of either of these methods varied depending on how well the stakeholders knew each other and the familiarity of the pilot group with participatory modelling in general.

The Regional Cluster Leads were asked to identify key quadruple-helix stakeholders from their pilot region to participate in the focus group events to validate the draft methodology for governance and policy analysis. Following extensive communication with the cluster leads and stakeholders, the focus group events were organised throughout November 2022 (see Table 1), involving roughly 10 selected stakeholders per pilot region. In the case of the pilot region in Slovakia, it was determined that a survey would be most effective. Wageningen Research was also engaged during the planning and implementation of focus group events to contribute as participants with their expertise on the topic and to draw insights for the development indicators (task 3.2) as part of the methodology development and application 2023/24.

The results of the working steps outlined above, including the validation and co-creation during the focus group events includes a methodology which comprises three parts: 1) A governance framework, including basic governance functions, assessment criteria and KPIs; 2) An analysis model for application, outlining key actors and their functional relationships; and 3) an assessment taxonomy allowing to contextualise and cluster assessment results.

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4 METHODOLOGY FOR GOVERNANCE AND POLICY ASSESSMENT

The following chapter presents an outline of the analytical framework and methodology that will be used in the BioModels4Regions project to analyse the governance practices and related policies in place in the six pilot regions to steer the bio-based economy. The methodology consists of three components: 1) A governance framework, including basic governance functions, assessment criteria and KPIs; 2) An analysis model for application, outlining key actors and their functional relationships; and 3) an assessment taxonomy allowing to contextualise and cluster assessment results. In this the governance framework (component 1) provides the analytical background for the definition of the analysis model (component 2) that consists of a multi-levelled actor mapping as well as an outline of functional relationships between them which is shaped through participatory modelling to then be applied to the local regional context. Component 3 is dedicated to an in-depth qualitative analysis of governance models (practices in pilot regions) as well as to a clustering and benchmarking based on the assessment results from the application of the analysis model (component 2), providing an assessment taxonomy. Each methodological component is described in detail in the following sub-chapters.

4.1 COMPONENT 1: GOVERNANCE FRAMEWORK

In order to establish a functional scope for the analysis of the regional bio-based economy governance, a 3-tiered framework is developed, consisting of primary governance functions (tier 1, see inner circle) (Andonova et al., 2009), specific governance fields, relevant to a sustainable bio-based economy governance at regional level (tier 2, see outer circle) (see Adriázola et al., 2018), and assessment criteria (tier 3, see boxes), which are derived from tier 2 and form the criteria that are being assessed and evaluated as part of the project for each pilot region, using a set of existing (e.g. BERST case studies) and newly developed indicators (see figure 1 below).

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Governance framework, assessment criteria and KPIs

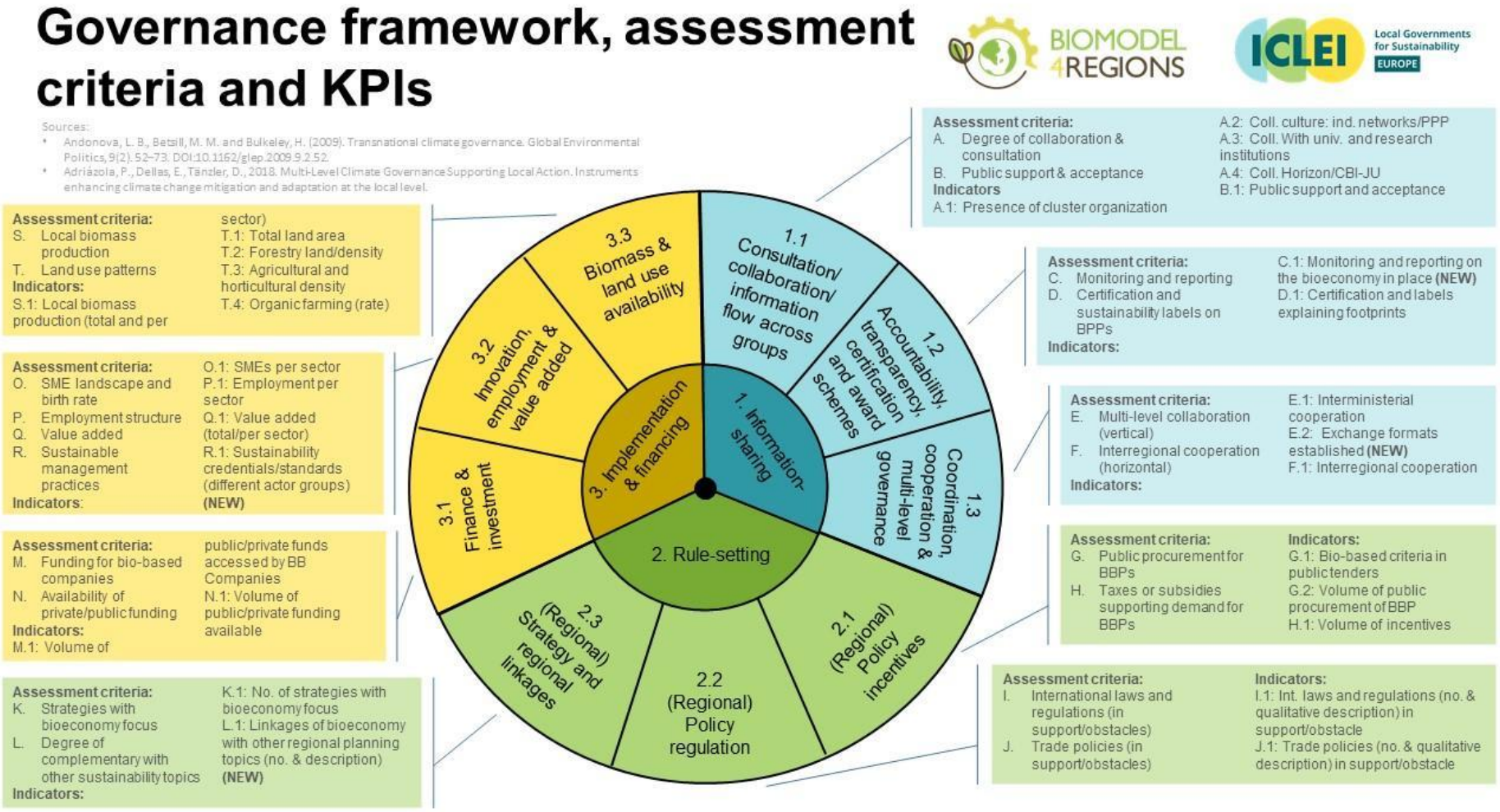

Figure 1 Governance Framework - overview, source: authors

Tier-1: Primary governance functions

Primary governance functions are established to denote the most basic purpose of governance, derived from Andonova et al. for the climate governance context. Basic governance functions include:

- **Information-sharing** - including all types of information flow (e.g. information, consultation, co-creation etc.) both vertically between different levels of e.g. governments and horizontally between different actors (or actor groups) within the governance system.
- **Rule-setting** - denoting the basic function of governance to set the framework conditions, rules and norms for the interaction and transaction of actors within the governance system.
- **Implementation and finance** - covering all aspects of the macro-economic sphere both monetary and *biophysical* (see Pauliuk et al., 2017) that are related to implementation and realisation of the transition from a linear, fossil-based economy to a more circular, bio-based one.

Tier-2 Functional fields of bio-based economy governance

The second tier includes functional governance fields for the bio-based economy (in principle also applicable to other areas), breaking down the three primary governance functions identified in tier-1. These functional governance fields are not exclusively focused on regional level actors, but mostly span across multiple governance levels.

- **Consultation, collaboration and information flow across actors -** including all types of information flow for all types of purposes and between all actor groups.
- **Accountability, transparency, certification and award schemes -** covering any types of practices between actor groups that are designed to promote transparency and accountability in production and consumption (industrial sphere) or monitoring and reporting (public sphere).
- **Coordination, collaboration and multi-level governance -** including any practices or formalised mechanisms for collaboration and coordination in place, both horizontally and vertically (multi-level governance & multi-level collaboration).
- **Policy incentives -** comprising all types of policy-induced incentives to stimulate and favour bio-based production and consumption such as taxes, subsidies, bans or other ways of *internalising externalities* (see Bithas, 2011).
- **Policy regulation -** including all types of regulations along the bio-based value chain and across multiple government levels (including EU level), e.g. relevant trade, agriculture and health regulations, EU By-product Criteria, EU End-of-Waste Criteria, Food Packaging and Clean Energy, etc.
- **Regional strategy and regional linkages -** refers to the kind of regional bio-based economy strategy and vision setting by the regional government (and its related institutions) as well as to the depth of integration and linkages with other regionally mandated tasks as well as economic and sustainability strategies (e.g. climate change, circular economy, resilience etc.)
- **Finance and investment -** referring to the different types of public and private financing and investment and its availability in the national or regional context.

- **Innovation, employment and value added -** involving the structure of the regional and local bio-based markets and its interlinkages with the national level. It also involves innovation potential, sustainable management practices and the employment structure (e.g. agriculture vs. high-tech sectors) within those markets as well as the gross value added per bio-based sector.
- **Local biomass production and land use -** including the types and quantities of bio-based feedstock materials circulated in the bio-based economy as well as a stock-taking of the prevalent regional land-use patterns.

Tier-3: Assessment Criteria and Key Performance Indicators (KPIs)

Assessment (or evaluation) criteria have been developed to provide the means to evaluate the results of the application of the analysis model (component 2). The initial set of indicators (developed by Wageningen and complemented by ICLEI - see ANNEX 1) should be used to verify the performance of a given criteria. The evaluation of assessment criteria in turn through KPIs (both qualitative and quantitative indicators), will help identify challenges and opportunities - and in particular support the formulation of recommendations for an improved bio-based economy governance and the development of bio-based economy strategies in the six pilot regions as part of the BioModels4Regions project.

Depending on the final set of assessment criteria and KPIs, several indicators can be grouped to determine the performance on a given evaluation criteria. Examples of assessment criteria are e.g. *the degree of collaboration between different actors*, *public procurement for bio-based products (BBPs), tariffs, taxes or subsidies supporting demand for BBPs, interregional laws and regulations (in support/obstacles), strategies with bio-based economy focus, SME landscape and birth rate* and others (see figure 1 above and ANNEX 1 for details). Tier-3, both the assessment criteria and the KPIs are not final in this report, but are subject to further development (final selection and data collection), and tailoring to specific regional contexts before applying the analysis model (component 2).

4.2 Component 2: Analysis Model

The model should be applicable to the governance/policy practices in all the pilot regions, starting from an abstract, more aggregated version and be gradually expanded incorporating the feedback received through the focus groups and workshops. The model qualifies the relationships along the predefined criteria linked to the governance functions a) information, b) rule-setting and c) implementation and financing as presented in more detail in chapter 4.1 above. The model is in a first step qualitative and will be developed into a semi-quantitative model based on the data available in the pilot regions (figure 1). The model is centred around the understanding of the actor network and their dependencies through processes, policies etc. that are defined via the governance functions. The dependencies are represented as one-directional to allow a clearer cut definition of the relationships.

A first preliminary version of the governance model was developed based on literature review and experiences from previous projects (Version 0.1). The version was shared with the regional clusters and experts. However, the model remained abstract to the participants.

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The current representation is bringing together the findings from the focus groups and desk research respecting the conditions in the specific regions. At this point it is to be considered as a second preliminary version (Version 0.2). The findings enlarged the number of actors and helped deepen the understanding of the dependencies. The models will be explained in the following section along the governance functions and bio-based economy governance fields.

- **Actors**

The following table gives an overview of the actors on the different levels of governance identifying their status as either public or private.

TABLE 2 SUMMARY OF ACTORS IDENTIFIED RELEVANT ON BIO-BASED ECONOMY IN THE PILOT REGIONS

	Public	Private
European	• European Commission (EC)	• EU standardisation organisations (CEN) • European think-tanks and networks • Industry (Consortium Bio-based Industry, European Region for Innovation in Agriculture, Food and Forestry (ERIAFF))
National	• National government/ministries • Interministerial task groups • National Agencies • Academic Training	• National standardisation organisations • National think tanks • National bio-based economy clusters • Certification institutes • Insurances • Investors
Regional	• Regional government • Committee of the Regions • Regional (development) agencies • Academic training	• Regional bio-based economy clusters • Regional bio-based economy steering boards • Regional steering groups on relevant linked topics • Secondary vocational education • Primary education • Waste handlers • Training academies
Local	• Municipal agencies, departments	• Land-use competitor • Biomass converter • Biomass processor • Biomass pre-treater • Biomass production • Waste handlers

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		• Consumers • Organised citizen representatives • Citizens • Investors

- **Information-sharing**

Bio-based economy is one of the principal topics in cross-fertilisation of knowledge between actors/regions (as well cross-border), finding appreciation in several European programmes such as Horizon Europe and INTERREG, in which several of the pilot regions take or took part. Furthermore, several clusters are partnering on national or regional level to European initiatives such as the “Circular Bio-Based Europe Joint Undertaking” or “Bio-based Industries Consortium''.

The cross-cutting nature asks for a cross-cutting approach between regional departments and across the governance levels. The dialogue between institutions at the regional level was mentioned as necessary but challenging (Tuscany (IT)). Similar notions on cross-sectoral corporations on a regional level were shared (Nitra (SR)).

Digital support could be a means to better communicate and visualise (Northern Sweden (SW)).

To increase transparency and accountability monitoring on the advancement of bio-based economy takes in some cases the framework of the EU programmes, the national bio-based economy strategy or/and on the level of cluster organisations (South-West Delta Region (NL)). Certification and labelling to support accountability and to avoid greenwashing was perceived as relevant but too complex (South-West Delta Region (NL)).

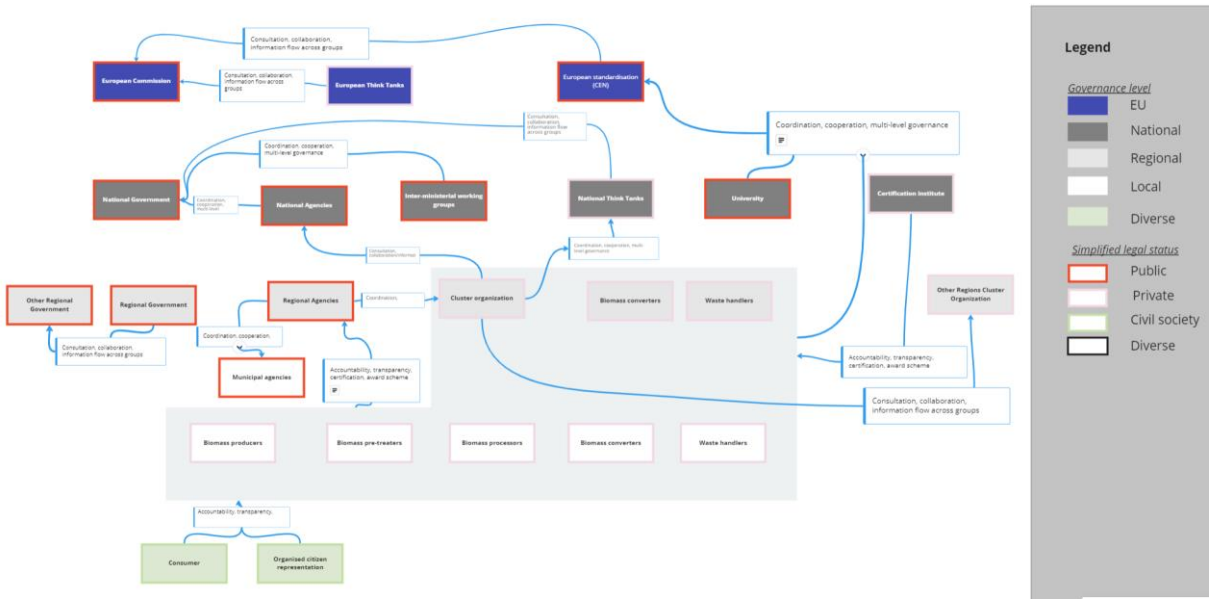

Figure 2 Analysis model (component 2) - information-sharing, source: authors

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- **Rule-setting**

The regions mentioned that the cross-cutting nature of bio-based economy might create challenges for regulators, resulting in an over-complex and sometimes incoherent regulation landscape (South-West Delta Region (NL)). The slow innovation of regulations might likewise cause issues since new products may not enter the market as would be economically necessary, hampering innovation to be rolled out (Tuscany (IT), Nitra (SR)). Policies should allow multi-dimensional use of material and products (awareness raising and policy support). Labelling should increase awareness in the consumers but as well in retail and prevent greenwashing (South-West Delta Region (NL)).

In most regions the education on bio-based economy focuses on tertiary education. In some cases, primary school or secondary school programmes are tested/developed (South-West Delta Region) or in place (Normandie (FR), Northern Sweden (SE)). Universities and research centres are mentioned as the primary innovation drivers for bio-based economy in all regions.

The stakeholder focus is in all regions only to a minor degree encompassing the civil society. Mainly in their role as consumer or as in the case of the Swedish regions as owners of the target resource (majority of owners of forest are small family businesses).

Standardisation from the European level was identified as more important than by national standardisation organisations. While standardisation is mainly promoted to be a motor for innovation, literature on the South-West Delta case shows that the alliances in standardisation can as well prevent competing products to gain traction (Elsamny, and Gianoli 2023). The only link between bio-based economy and taxation was mentioned for the Swedish case on carbon taxation.

Several strategies on national level are linked to the bio-based economy, not in all cases a specific national bio-based economy exists. However, in one case a cross-country strategy was identified. Regional bioeconomy strategies are under preparation while in two cases already enacted.

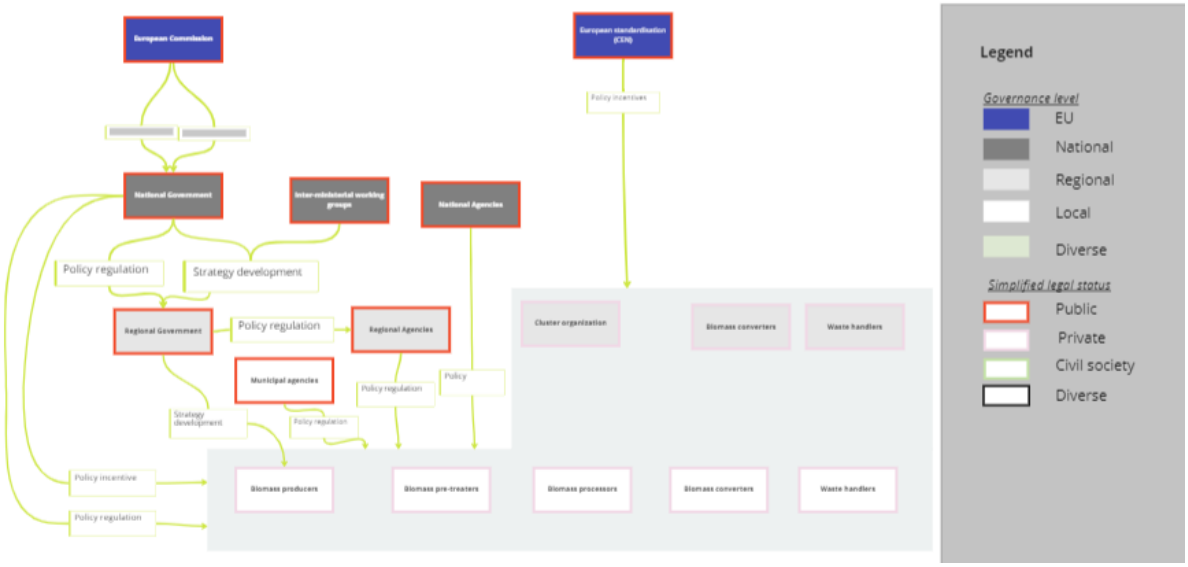

Figure 3: Analysis model (component 2) - rule-setting, source: authors

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- **Implementation and finance**

Several regions link their work, more or less strongly, to the European regional smart specialisation strategy and the research and innovation strategies for smart specialisation (RIS3) (e.g. Tuscany (IT, Västernorrlands (SW), Nitra (SR), Western Macedonia). Smart specialisation is key in the European regional innovation and cohesion policy (Martinidis 2022).

European funds to enhance cohesion and just transition are linked to the bio-based economy via regional mechanisms (South-West Delta Region (NL)). Several European or national research programmes are used for strategic development and funding of projects on bio-based economy. Furthermore, regional support funds might be linked in future (Nitra (SR)).

Innovation vouchers are distributed by regions (South-West Delta Region (NL)). Innovation comes mainly from research and innovation institutions, but might be limited due to mind-sets, policies or funding opportunities.

Bio-based economy or adjacent disciples are part of lifelong learning and re-skilling programmes. Universities and secondary vocational schools cover the topic. Primary and secondary school education are targeted to sensibilize the next generation for the topic.

Jobs structure covers operation to strategy. Ownership of relevant businesses is in some cases strongly fragmented (Northern Sweden (SE)). A new focus was given by the Swedish case which highlighted that gender consideration should be included (Northern Sweden (SE)).

Land-use patterns and land-use conflicts play a role in all cases. Considerations around ensuring the natural capital are recent but will develop traction, which will link to sustainable management practices. Sustainable practices and the consideration of traditional practices of minority groups should be reflected in the governance model (Northern Sweden (SE)).

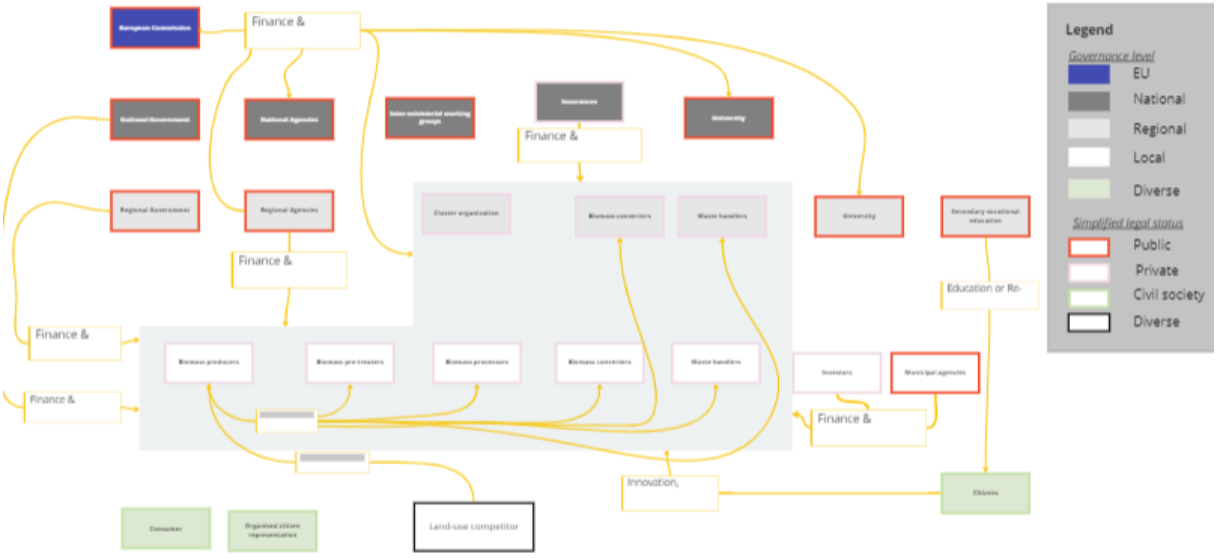

Figure 4: Analysis model (component 2) - finance & implementation, source: authors

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4.3 COMPONENT 3: INTERPRETATION OF RESULTS

An 'assessment taxonomy' or a 'taxonomy for clustering of results' is developed in order to support the interpretation of results from the analysis model application and evaluation via the assessment criteria and KPIs as well as provide the basis for an in-depth governance and policy analysis. Two options of results clustering and interpretation to support the in-depth analysis are outlined below and should be used in conjunction with one another.

Results-based analysis

The results from the application of the analysis model (component 2) and evaluation of assessment criteria via KPIs is being implemented and documented in an Excel Spreadsheet. A basic aggregation and weighting approach are being used to aggregate the assessment criteria performance on the fields of governance for a bio-based economy (see component 1 above). This will enable identifying and visualising barriers and opportunities in any way sensible, developing high-level statements and recommendations on a given governance field (see exemplary mock-ups in figures 5, 6 & 7 below).

Figure 5: Spider graph showing exemplary performance on tier-2 governance fields

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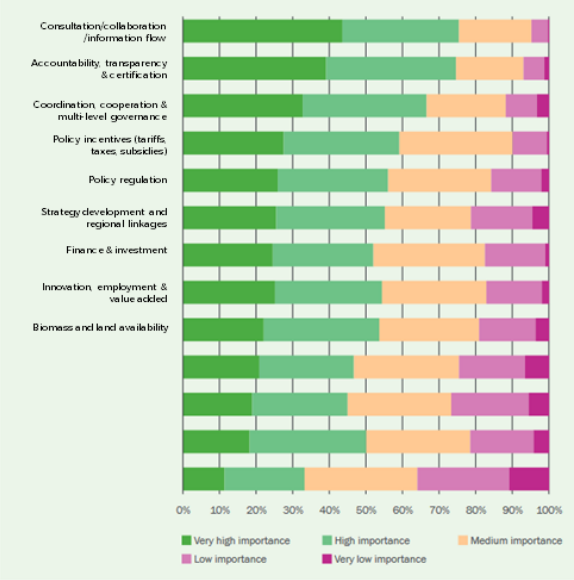

Figure 6: Scaling chart of exemplary performance on given governance fields/assessment criteria (tier2/tier-3)

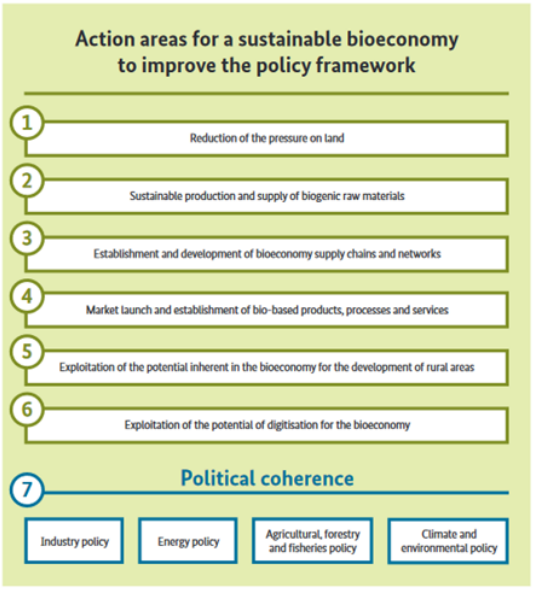

Figure 7: Exemplary high-level statements and recommendations derived from scale chart

Next, a basic narrative canvas should be applied according to the aggregated assessment results. The narrative canvas is quite generic in nature and is meant to be merely the starting point for a more tailored and iterative narrative, preceding and following the in-depth analysis of the governance model and related policies in task 3.3 (see below).

Table 3: Narrative canvas for contextualization aggregated results from the model application

Assessment Results	Narrative context and benchmark
High overall performance in information-sharing	The regional bio-based economy has well established structures for information sharing both vertically (between governance fields/government levels) and horizontally (between actor groups at regional level), including with the public. There is a high degree of bio-based industry collaboration. Furthermore, labels for BBPs are effectively used and applied and certification mechanisms in place to stimulate and regulate BB markets. The regional government (and its institutions and agencies) has reporting schemes in place to verify progress along a circular bio-based economy transition.
High overall performance in rule-setting	Based on its integrated and dedicated bio-based economy strategy, the regional bio-based economy uses or advocates for using all incentivising mechanisms possible to stimulate production and consumption of BBPs. It has a fully established regional regulatory framework in place that favours the uptake of bio-based products and it fully understands how national or EU regulations impact

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	regionally and advocates to the extent possible for favourable change.
High overall performance finance and implementation	The regional bio-based economy is characterised by robust value chains and strongly developed and diversified bio-based market structures, high-value added and a workforce employed in well-paid jobs. There are prospective and sustainably managed land and water ecosystems in place to derive feedstock for the bio-based economy and land-use and sector conflicts are minimised. Additionally, there is dedicated public funding available for strategic bio-based economy development and the framework conditions and bio-based technology readiness levels are favourable for private investments.

Bioeconomic pathways and EU context

In a second step, the results obtained from the analysis will be linked to bioeconomic transformation pathways from the literature (see Dietz et al., 2018) to add a trajectory to the analysis and recommendations derived thereafter as well as to cluster the results and make them more usable for replication in other regions throughout Europe.

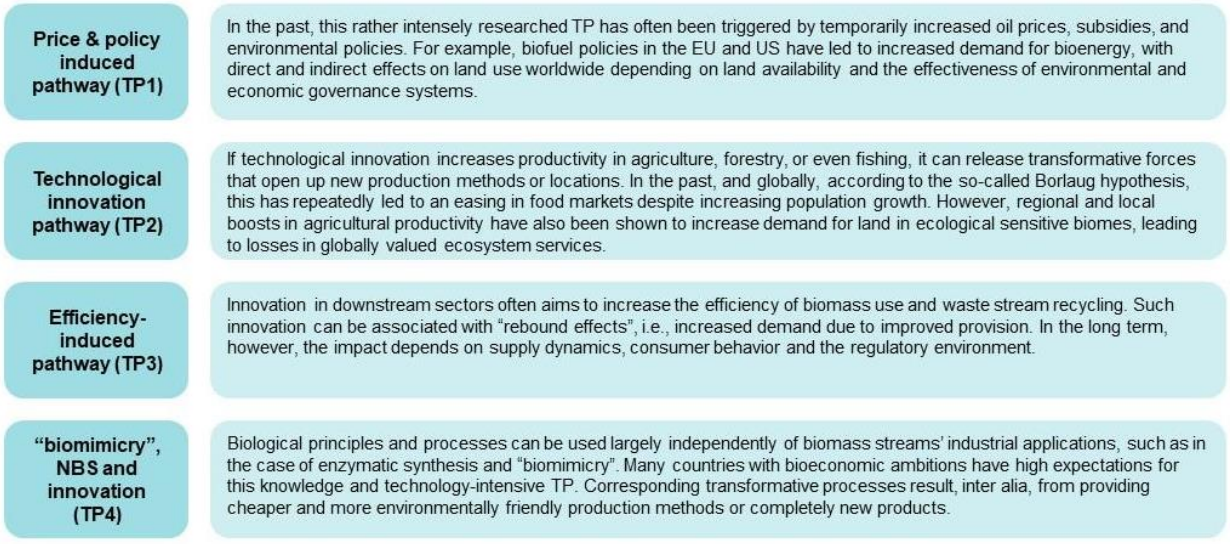

Figure 8: Exemplary illustration of bio-based economy development pathways, Source: Dietz et al., 2018

Additionally, the focus in the creation of analysis outputs may differ from region to region and be tailored to the needs emerging locally. The analysis may e.g. place special focus on degree of multi-stakeholder engagement, the characteristics of multi-level (vertical) governance or any sectoral focus, the role of civil society or technology etc. (see Jänicke, 2015; Jänicke and Lindemann, 2010, 2010; Mattijssen et al., 2018).

In-depth analysis of governance model and related policies

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Following the first analysis and assessment of findings from the application of the analysis model, the policy landscape will be mapped in depth in T3.3. The in-depth policy and structural analysis will focus on areas of particular interest for the region as well as on bio-based economy governance fields with low overall performance.

Already from the focus group events, it became clear that European policies in place have a strong influence on local bioeconomies. In several cases policies were mentioned in connection to innovation and how they might affect either permits for new installations or the market entry of new products. In several cases it was highlighted that waste policies might need updates, including an understanding of waste as a resource.

European policies to be considered in the mapping highlighted in the discourse were the EU *'Nature Restoration Law', 'Deforestation-free Supply Chain', 'LULUCF Regulation' and* the *'Soil Strategy'*. While national policies should not be neglected, few regional policies seem to play a role (mainly on waste management practices mentioned).

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5 FOCUS GROUP AND DESKTOP RESEARCH FINDINGS

In the focus groups the participants were asked to appraise the functions and the generic model based on the specific understanding and knowledge of the dependencies, actors, policies, resources, etc. Interactive exchange, the use of slide support and a digital whiteboard supported the focus groups. Discussions centred around actors, policies, funding, and conflicts (land-use, interest). The following paragraphs will give summaries of the focus group findings which are supported by extensive desk research to provide further information. Based on the findings and additional exchange the specificities of the regional objectives and targets will be included in the assessment model and indicators work starting in 2023.

Tuscany, Italy

The interplay between the national level and the regional level is top-down, while the regions are able to define their strategies and priorities. Any regional development needs to link to the existing Italian Bio-based economy strategy (BIT II) (2019) and national Bio-based economy Action plan (2021). The BIT II is part of the implementation process of the National Smart Specialization Strategy (SNSI).

A monitoring system on national level is in place, supported by the National Institute of statistics. The core indicators and knowledges on data availability will support the further work. Additionally, the circularity index which examines parameters related to production, consumption, waste management, secondary raw materials market, investments and employment will be considered. Regions play a role in the national governance structure on bio-based economy, electing representatives to the National Bio-based economy Coordination Board (CNBBSV).

At this point in time no regional bio-based economy strategy is in place in the province Tuscany. However, laws on circular economy are in place (Regional Law no. 48/2018, Regional Law n.34/2020). This is reflected in a lack of an institutionalised governance structure on regional level for bio-based economy in Tuscany. The Regional Council, with Decision No. 30 of 25 June 2018, established the 'Regional Table for the promotion of the circular economy. In future regional “working tables” may be re-established following a blueprint on the national level. At this point, no lead organisation or concrete timeline was mentioned. Tuscany has adopted its decarbonisation strategy 'Toscana Carbon Neutral 2050'.

There is no dedicated Regional Council Directorate in charge of bio-based economy but it is included in the work of the Agriculture and Rural Development Directorate. It is in charge of the strategic development, the link to the rural development programme, the other directories that support regional S3 and the European Rural Development Fund (FESR). The councillors overseeing tasks relating to bio-based economy are Councillor for the Environment, Circular Economy, Soil Defence, Public Works and Civil Protection and Councillor of Agro-food, hunting and fishing. The Tuscany region will focus on the waste dimension of bio-based economy strategy development.

Regulatory aspects and standards belong to the national and European level. Current policy developments that were highlighted linking to the regional project is the European soil strategy. The soil strategy is understood as key for the waste and water linking e.g. to the usage of fertilisers from waste residuals.

Increasing the workforce in the bio-based economy focuses on tertiary education programmes. Mainly linking to topics related to sustainability (bio-based economy being part of that) but there are dedicated research departments on bio-based economy emerging (e.g. Institute for Bio-based economy - CNR National Research Council (FLORENCE Area)).

The Italian Strategy for the Bio-based economy (BIT II), which is part of the implementation process of the National S3, plans to increase the current output of the Italian bio-based economy (approximately 250 billion euro/year) and the level of employment (around 1.7 million) by 20 per cent by 2030.

Funding opportunities link to the European Rural Development Fund (FESR). No private funding on bio-based economy was mentioned. A new funding instrument is being established in the Tuscany region linking to bio-based economy (technology districts). A lively start-up scene is present that is mainly driven by Universities.

Region	Governance structure
Tuscany, Italy	● Strong linking to EU strategy and funding ● Steered by the national level governance and strategy on bio-based economy ● Regional strategy incorporated in the RIS3 ● No institutionalised regional governance on bio-based economy in place, yet. ● Regional tables might be set up, coordinated by national technology cluster. ● Triple helix -> top-down with strong regional identity
Good/supportive governance	
The question of good or supportive governance is not easy to answer. One reason is that the topic is cross-sectorial, meaning there is a horizontal dimension to it as well as it spans over different administrative levels (vertical dimension) - different departments at regional and local levels are concerned. Key for the Italian regions is an industrial urban symbiosis with economic actors in the region, to ensure an end-of-waste user network locally. Yet the value chain is not fully developed. As a supportive measure, an action plan on industrial symbioses might be relevant.	

Northern territories, Sweden

The 'Swedish Research and Innovation Strategy for a Bio-based Economy' (2012) can be understood as a starting point to the national bioeconomy strategy. The Swedish bio-based economy strategy is under development. The 'Nordic Bio-based economy' and 'Baltic Bio-based economy' is already in place, which is a macro-regional initiative on bio-based economy between all Nordic and Baltic countries. The strategy is important for rural development. The Nordic strategy is supported by a 15 point action plan. To date a national Forest Programme exists that is for now the main vocal point in Sweden's bio-based economy. National ministries in charge are the Ministry of Enterprise and Innovation, Ministry of Environment and the Ministry of Rural Affairs. Other Ministries that relate are the Ministry of Finance, the Ministry of Education and the Ministry of Infrastructure. Entry point to the Swedish bio-based economy is forestry due to its identification capacity and ownership structure. The pilot regions are located

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in the northern part of Sweden and constitute in the vast majority rural areas with sparse populations. The regions take part in the S3 programme and e.g. Västernorrlands published in the new period 2021-2027 one focus area 'forest-based bio-based economy'. The regions are characterised by forestry and agriculture but as well mining. Living in the rural areas results in a diversity of income sources, many having two to three businesses to afford living. Due to these constraints there are migration tendencies into cities.

Inter-regional but especially inter-municipal corporations are important. The former meet in "Swedish Region for Bio-based economy", but all regions have their own regional forest strategies. These strategies are a combination of regional development, smart technology and wood building. Steering groups are linked and work cross-region in some cases. In future the inter-municipal collaboration will need a wider consideration since forests are "not isolated green islands". Current strategies were perceived as watered-down compilations of opinions.

Policies on European level were discussed, e.g. EU law 'Deforestation-free Supply Chain'. On a national level relevant policies are the carbon tax (1992), national climate plans and the Circular Economy Strategy (2020). The latter references the coming bioeconomy strategy. Based on desk research the revised national forestry accounting plan for Sweden 2012-2025 could play a role. This links to the reporting of forestry under the EU ETS. While on national level an inter-ministerial group will be developing the bioeconomy strategy the regional bio-based economy strategies are on their way. Participants urged that the regional strategies should go beyond forestry including hunting, forging of products and tourism. Thus, needing a diverse set of industries and business models. Considerations of minority groups and their traditions should be considered in the bio-based economy strategy. Increasing focus is given to the added value of the by-products in bio-based economy (saw dust, bark etc.) that will be valivalorised. Participants mention difficulty in moving from demonstration to operation. Again, the legislation on waste plays a role and creates constraints. Current strategies were perceived as watered-down compilations of opinions.

Ownership in forestry is highly fragmented consisting of few bis companies but with a main share of small family business. The ownership of these family businesses is often in the hands of women. The paper industry invests in increasing production over the last decade sponsoring energy power plants and industrial symbioses.

Education in bio-based economy is mainly in higher education. Education in forestry has a long tradition and several programs are available. Innovation must overcome old mindsets. The focus groups did not allow us to go deeper into questions around employment structure and innovation in more detail.

The ambitious goals do not align with limited and shrinking public investment. Public, private and blended funding is available. Västernorrland describes in the RIS3 2021-2017 application a detailed funding strategy which targets external financing. European funds and programmes (Interreg, COSME, Horizon Europe, Baltic Sea Programmes) Structural Funds programmes (ERDF, ESF+, JTS) and national funding authorities such as the Swedish Energy Agency, KK Foundation, Tillväxtverket, Vinnova and various foundations are targeted.

Besides funding and finance in the bio-based economy insurance is an important consideration. Especially under changing climate conditions the risk increases, particularly the risk of storms is an issue for small scale farmers. Adaptation measures and sustainable practices come into play. At this time the number of insurers insuring forests is limited (two were mentioned). While the risks are increasing the investments and investors might decrease.

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Region	Governance structure
Northern Regions, Sweden	• Linking to EU and Nordic/Balitic strategy • National strategy under development • Regional forest strategies current vocal point which needs to be enlarged • Regional strategies underdevelopment in bottom-up processes • Attempting quadruple helix • Twin developments
Good/supportive governance	
Crucial for governance is an understanding of the status quo of bio-based economy, aspects, actors, tools. Good and supportive governance has the objective to create greater good for current and future generations through sustainability support. This should be facilitated by increasing the good/positive developments while balancing social and environmental aspects as a whole. This can be supported by smart visualisation and continued appraisal to the UN SDGs. New frameworks could be of support. A particular focus should be given to the small entities such as e.g. small forest owners to overcome fragmentation and create combined might. Close relationship between actors is necessary. Enabling mechanisms on one side need to be met by compliance on the other. Trends should be monitored and understood to be built upon, prevented or prepared for.	

Western Macedonia

Greece has no national bio-based economy strategy in place, yet. The development is linked to European programmes. Greece will be developing a national strategy. The just transition and the just energy transition are important frameworks for the Greece bio-based economy. The “National renewable action plan (2010)”, the “National Energy and Climate Action plan 2021-20230” links to the circular economy. Law 4414/2016 as the support scheme for renewable electricity in Greece outlining feed-in tariffs and market participation play a role for the pilot region.

The main governmental body implementing bio-based economy policies is the Ministry of Environment and Energy (YPEN) which launched the “1st National Strategy for the Circular Economy” in 2018 for public consultation. In addition, the “Strategic plan for the development of research, technology and innovation under the National Strategic Reference Framework (NSRF) 2007-13” aims to restructure the Greek economy, gearing it towards high value added products and services, and achieve the transition to a knowledge based economy and society. Bio-based economy in the RIS3 and S3 is not clearly mentioned. The central government could play a role to support the regional strategy development using Western Macedonia as a testbed.

Western Macedonia is one of the Greek pioneers in bio-based economy and has the chance to drive the discourse on the national level. Central Macedonia and Crete have bio-based

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economy strategies in place. Western Macedonia is co-leading the S3 industrial modernisation partnership BERRY+ which identified the circular economy as a driver for economic development.

In Western Macedonia key sectors that are concerned with bio-based economy are at present forestry (managed by Directorate of Forest), industry (Department of Industry), Agriculture and Livestock Farming (Directorate of Rural Economy), Urban Waste (managed by municipalities and DIADYMA S.A.) and energy (Ministry of Energy and Environment). Therefore, a strong cross-cutting dialogue and cooperation is necessary. Neither on national nor regional exists a strategic steering board on strategic decision-making on bio-based economy. However, CLuBE as a platform includes a steering committee.

So far businesses drive the discourse around regional bio-based economy. Bio-based economy gives an opportunity to address the environmental challenges possible, counteracting environmental degradation and health issues. The bio-based economy could prove to be a growth motor for the regional economy. Western Macedonia seeks to use the bio-based economy as one of the decisive factors and major pillars of the post-lignite era. Western Macedonia comprises the major lignite deposits Post-lignite strategy include the re-skilling or reallocation of workforce in Western Macedonia (6 000 staff re-employment), where (youth) unemployment rate is already high. The main barrier to innovation is seen in limited funding opportunities. So far, the strategy includes a focus on the construction sector. Bio-based economy could play a vital role in the future and the potential should be explored, going beyond the estimate of ~640 employees in agriculture production.

The region of Western-Macedonia is one of the more active regions on biomass valorisation in Greece. Closing the loop in the circular economy will bring in biomass waste, including the residues from agro-crops and livestock as an excellent feedstock for fuels and chemical production. However, a lacking awareness is perceived on the level of (national) political decision-makers and consumers concerning the environmental and societal potential of bio-based economy for the region.

CLuBE as a cluster is fostering collaboration, e.g. fostering transition to green hydrogen. B2B collaboration brings together a circular economy, just green energy transition and bio-based economy. The B2B cooperation is in place and strong in specific sectors such as waste heat recovery and usage from biogas power plants. Biomass residues from biogas plants are used by farmers as fertilisers/soil amelioration. Bio-economy and Sustainable Growth Laboratory promote and support academic knowledge. They develop synergies with public and private companies, international organisations, multinational corporations and consultancy firms involved in bio-based economy sector

Mainly regional universities are the source for innovation, however there seems no strong start-up culture in bio-based economy, yet. The Regional Innovation Scoreboard (Hollanders et al., 2021) labels Western Macedonia as an ‘emerging innovator’.

Region	Governance structure
Western Macedonia, Greece	● Linking to EU strategy ● No national strategy ● Region a pilot case for Greece ● Regional strategy to be developed

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	• Triple helix • Regional piloting
Good/supportive governance	
• Changing the attitude on research and development policy • Create optimal conditions for cooperation and coordination among stakeholders • Emergence of knowledge as a dominant economic factor • Help tackle recent challenges • Capitalise on adjacent activities on just green development	

Normandie, France

National bioeconmy strategy (SNB) is in place (2017), which is supported by the Bioeconmy Action Plan (2018). The strategy itself does not include targets, but links e.g. to sustainability, innovation and societal developments.

Relevant activities on a national level is e.g. the roadmap for (climate) transition towards 2050, which references again bio-based economy. 'National Strategy on Biomass Mobilisation' (2018) which makes several references to bioeoconomy but few to maritime biomass. The mobilisation strategy highlights the need for regional implementation. The pilot region will focus on the valorisation of shellfish or rather its by-products in Lower Normandy - linking to the maritime biomass mobilisation. The maritime sector is under pressure after Brexit, several alterations since 2019 between the fishing communities on both sides of the channel. The maritime sector is characterised by strict and restrictive regulations for companies. To date the French regulatory status of shellfish by/co-products is still not clear. Hinting at challenges around the valorisation of waste. The RIS3 2021-2027 is on its way, which has a strong focus on bio-based economy for Normandie.

The cluster organisation Aquimer focuses on valorisation of aquatic products. It is supported by Bio-based economy for change which is charged by the Normandie Region with the development of the regional bioeconmy strategy. In 2022 the regional bioeconomic platform was launched informing about the bio-based economy, the status of the strategy development it serves as well as a platform to inform about the actors and initiatives. Different clubs or round tables are in place, such as the EcoMer club that is steered by Aquimer. In 2023 several important steps will be taken such as drafting of a global Bio-based economy strategy document (piloted by Direction Agriculture and Resource Marin, DARM) and the continuation of the steering board including relevant stakeholders (COPIL). The COPIL met once and regular meetings will be scheduled. The COPIL will engage with the wider community in 2023. However, civil society seems not to be the target. A regional monitoring is not in place, yet but is planned.

Education programmes on bio-based economy are steered by higher education institutes. However, participants mentioned specific programs on bio-based industry in secondary vocational schools.

Funding for the bio-based economy in the region is accessible through the AMI Innov'BioEco which is in its 3rd rally (beginning 2023).

Region	Governance structure
Normandy, France	• Linking to EU strategy

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	• National strategy and action plan in place • Regional strategy under development in a bottom-up process • Development of steering board on regional level • Triple helix • Top-down with strong regional identity
Good/supportive governance	

Nitra Self-Governing Region (NSK), Slovakia

Slovakia has no national bio-based economy strategy in place yet. The development is linked to European programs. Slovakia identified bio-based economy as a priority topic in the RIS3 2022-2027 period and will be developing a national strategy.

Several public funded projects link to the development of a national bio-based economy strategy (CEE2ACT) and regional strategy for Nitra district (Power4Region, BioRegion). The project CEE2ACT will provide national roadmaps for the bio-based economy strategies, created in a participatory bottom-up approach. These roadmaps will align the commitment and ambitions of the bio-based economy sectors and will be the foundation of the national policy to be adopted as the official Strategy by the competent authorities.

Other relevant strategies linking to bio-based economy are e.g. the “Strategic Plan of the Common Agricultural Policy (2021-2027)”, which is in the preparation phase. Other relevant strategies or plans are the “National Energy and Climate Plan" (as per (EU) 2018/1999), “Greener Slovakia – Strategy of the Environmental Policy of the Slovak Republic until 2030”, “Strategy of economic policy of the Slovak Republic until 2030” and the “Low-Carbon Development Strategy of the Slovak Republic until 2030 with a view to 2050”. The former mentions low carbon developments or circular economy, while the later mentions bio-based economy linked to agriculture. Mentioned is in the frame of the Power4Bio the update of RIS3 strategy of the Nitra Self-Governing Region for the years 2021–2027. However, the online research did not yield results.

Since bio-based economy is a relatively new sector in Slovakia, there are no specific policies or regulations in effect (as well not targeting taxation) only support mechanisms. Likewise, no national monitoring is in place, however the Bio-based economy Cluster (BEC) engages with partners in a voluntary monitoring on some aspects of bio-based economy. Relevant area for the pilot region is the “Slovak Waste Management Programme” (SWMP) for 2021-2025 prepared by the Ministry of Environment of the Slovak Republic and the regulation on waste separation, including composting. According to the law, municipalities are obliged to introduce a system of biological collection of food waste starting on January 1, 2021. However, the law lacks rules on composting including even animal components. BEC, together with other interested entities, is establishing an operational group with the objective to create a methodology for bio-based waste aiming for high-value and high-quality compost for the amelioration and restoration of the soil quality. The pilot develops high value added composting

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of bio-waste including sanitization (through microbiome) in order to prevent introduction and development of pathogens.

Education linked to bio-based economy takes place at Universities (forestry, biotechnology, environmental science and ecology, agrobiology and food, wood science and technology) and secondary vocational schools (e.g. agriculture and rural services).

The main drivers of innovation in the bio-based economy in Slovakia are: the Slovak Agricultural University in Nitra, the National Agricultural and Food Center and the BEC. BEC creates an innovation ecosystem for knowledge and technology transfer between research and the agri-food industry (SME), including start-ups, including relevant policies through mutual cooperation. BEC also supports start-ups and SMEs through challenges. However, business to research cooperation and B2B cooperation were identified as an area for improvement.

BEC describes the funding for bio-based economy as blended funding. Different funding opportunities exist. Funding is available via the European Structural and Investment Fund (EŠIF). The rural development funding mechanism in the pilot region is the LEADER NSK programme, representing a funding option for small-scaled circular economy projects throughout the Nitra Region. A wide range of projects is being funded, in the future it might put more emphasis on environmental aspects (forthcoming NSK Waste Management Programme).

Funding of innovation is in the form of innovation vouchers. For a more efficient drawing of funds in the new programming period Nitra region create a strategic development document titled “Programme of the Economic and Social Development of the Nitra Self-governing Region until 2030 / Integrated Territorial Strategy of the Nitra Self-governing Region until 2030” (PESD 2030).

Region	**Governance structure**
Nitra, Slovakia	• Linking to EU strategy • No national strategy • Regional strategy to be developed • Triple helix -> regional piloting
Good/supportive governance	
• developing and supporting the multi-stakeholder dialogue including local/regional government, industry, and research • unlocking existing support schemes and better targeting of supporting schemes for funding and subsidies that help promote the roll-out of technology in bio-based industry • supporting awareness among the citizens on the added values of bio-based economy for the society and environment • supporting regulations (European and national) to allow circularity in bio-waste processing in specific areas • targeting supportive regulation for bringing innovation to market	

The Netherlands

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Since 2018 a dedicated national bio-based economy strategy is in place. Already in 2012 a Memorandum on Bio-based Economy had been published. However, there is no dedicated action plan. The statistical bureau of the Netherlands (CSB) published a recent monitor report on bio-based economy in 2022. Frameworks relevant are under others the "Circular Economy in the Netherlands by 2050", the 'Transitional Agendas' (2018), Sustainable biomass and bioenergy in the Netherlands for 2030 (2016). Based on the Dutch Circular economy the Dutch government selected five economic sectors and value chains that will be the first to switch to a circular economy. These documents do not mention bio-based economy but bio-based industry/economy.

Governmental bodies of relevance for bio-based economy are the Ministry of Infrastructure and Water Management, the Ministry of Economic Affairs and Climate Policy, the Ministry of Agriculture, Nature and Food Quality and the Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland, RVO). On a national level a new cluster organisation emerges: Green Chemistry New Economy. This national cluster is still in its development phase, but will include Remport (North-East), Chemelot (South-East) and the Circular Bio-based Delta (South-West).

The bio-based Delta cluster is a triple-helix cooperation active since 2012. After aligning with the government policy for reaching 100% circularity by 2050 it became the Circular Bio-Based Cluster (CBBC). The cluster promoted the development of green products and spear-headed the bio-based economy strategy for the Delta region. The bio-based economy strategy is further determined by the national climate targets supporting net-zero objectives. To ensure the uptake of measures a monitoring is set-up, that encompasses impact, timing, investment, feedstock demand and closing the loop. Focus areas are bio feedstock, green chemistry, chemical recycling and waste valorisation. Bio-based Delta's vision is to drive the transition towards a net-zero and circularity in the Delta region. This accelerates the bio-based routes and circular solutions by creating new values. One of the primary resources is the sugar beets (sugar delta).

As a main hindrance towards a bio-based economy is the status or rather the flexibility to the status of waste. Once declared as waste, waste cannot be reintroduced as feedstock for the processes. Discussions and decisions on the end of waste are pending, still. Furthermore, each province has their own regulation on waste. One participant to the focus group stated that " the EU regulation doesn't help" in the sense to support the market integration of new innovative bio-based products. Inconsistency in EU regulation was mentioned, linking to the banning of single use plastic, which includes bio-plastics currently. Policies should allow multi-dimensional use of material and products (awareness raising and policy support) and prevent greenwashing. Accountability should be supported by clear and transparent. To date the labelling was perceived as not clear cut and overly complex.

The Delta region is located in the south-west of the Netherlands and includes the three administrative provinces Zeeland, North Brabant, South Holland, as well as major cities and ports (e.g. port of Rotterdam, North Sea Port). Challenges related to the spread across provinces is coordination and collaboration. The three regions are represented by economic development organisations: BOM (Brabant) + REWIN (West Brabant), Impuls Zeeland (Zeeland) and Innovation Quarter (South Holland), have bio-based economy targets and focus. Collaboration is between the regional clusters and development agencies but not between municipalities. For strategic decision-making they are supported by the Supervisory Board of Circular Bio-based Delta (BCBD), in which industry and representatives from the provinces

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(deputy) are present. The cluster works closely with the European neighbours and collaborates e.g. with circular bio-based Europe or other European cluster organisations (e.g. SPRING).

With the focus in the discussion on locally sourced sugar beet as a primary resource for the cluster's activities conflict between feedstock, food versus fuel/construction or any other resource was mentioned. Overall due to land scarcity in the Netherlands land-use conflicts are inherent and a topic in public awareness. The focus group agreed that public opinion matters particularly in this topic.

Funding in bio-based economy seems mainly through public funding or R&D investments of companies. Few blended funding was identified by the focus group. Besides European programmes some municipalities, e.g. Bergen op Zoom in the region of Brabant, issue vouchers to stimulate the bio-based economy. The 19k Euro vouchers are available to small bio-based economy businesses. The fund is made available through the province. The funding focuses on green chemistry. Other regions have similar voucher systems. A comprehensive view seems missing to date.

Comprising 58.5Mi Euros the Just Transition Fund (JTF) supports green chemistry, and is issued by the province Noord-Brabant, the region West-Brabant, the development agency REWIN and the EU. InvestNL funds bio-based projects e.g. in private-public partnership, one such was mentioned in the focus group (Releemt B.V.). In some cases, private investors seem to fund activities. There are public-private partnerships in R&D programmes in place, e.g. between TNO, VITO and Circular Bio-based Delta.

Education programmes focus on tertiary education. Translating research into education tools for pupils on education for primary and secondary schools is led by the Centre of Expertise Bio-based Economy (CoEBBE). The research at CoEBBE focuses on research with and for SMEs. Regarding life-long learning or re-skilling there are different programmes for the education of operators and for skilling the workforce on different levels in place that link to bio-based economy, one being at the University of Delft.
Universities, schools and research institutes were identified as the primary source for innovation. Spin offs from the universities when successful and attractive are embraced and supported by industry.

Region	**Governance structure**
Delta Region South-West, Netherlands	● Linking to EU strategy ● National strategy ● Regional strategy and monitoring ● Steering board ● Industry driven ● Triple helix -> strong regional identity and with national and transnational partners
Good/supportive governance	
The development of new bio-based economy value chains incorporates service provider actors (cluster, government etc.) and value-chain actors (SMEs, start-ups). Governance should consider availability of support instruments as subsidies for the different development levels. Good governance should develop a clear long-term vision for bio-based economy as	

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well as advancing and joint development of a common agenda, joint projects, and common communication. The common elements should target actors from the triple helix. Good governance untangles the complex policy and regulations landscape for better product development and market entry. Including policies that allow multi-dimensional use of material and products (awareness raising and policy support) and prevent greenwashing. Accountability is supported by clear and transparent labelling on the different products which raise better awareness in the retail sector and consumers.

6 SUMMARY & OUTLOOK

Methodological summary

- The generic model and methodology for the analysis of bio-based economy governance models is composed of three components: (1) the three-tiered governance framework, (2) the analysis model for application and (3) the interpretation of results.
- The three-tiered governance framework (component 1) consists of *basic governance functions* (tier-1), *bio-based economy governance fields* (tier-2) and *assessment criteria and KPIs* (tier-3).
- Tiers 1 & 2 are set, while tier-3 needs to be further developed and adapted to the regional context before working it into the analysis model (component 2) for application.
- The analysis model (component 2) is the main vehicle that will drive the analysis of governance and policy in the regions, using local data to qualify and assess performance for the established assessment criteria via KPIs.
- The interpretation of results (component 3) first foresees a series of standardised steps to group and classify the results from the model application, deriving a high-level narrative on the status quo. In a second step, the results will be discussed in the context of bio-based economy development pathways from the literature to understand and reflect generic drivers. Lastly, using all the above and based on the identified barriers and opportunities, an in-depth analysis is carried out for specific bio-based economy governance fields to better understand the impact of concrete local practices and policies.
- The application of the analysis model, interpretation of results and in-depth analysis will ultimately culminate in an Assessment Report, providing the basis for the development of bio-based economy strategy blueprints in the pilot regions.

Project-specific next steps

- Tailoring of the methodology, specifically the assessment criteria and KPIs to the regional context, through desktop work and WP2 workshops - involving regional cluster partners and Wageningen Research (January-March 2023).
- Application of analysis model (component 2) for each pilot region through desktop work and virtual meetings, working closely with regional cluster partners and Wageningen Research to obtain data for the KPI evaluation (March-October 2023).
- In-depth analysis of regional bio-based economy governance practices and policies based on assessment results through desk work and virtual meetings, working closely with regional cluster partners (October 2023-March 2024).

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- Development of assessment reports and recommendations (D3.3) to feed into regions' bio-based economy strategy blueprint development, working closely with regional cluster partners, Wageningen Research, Clube and APRE (March-June 2024).

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5. ANNEX

ANNEX 1: Outline of Governance framework for analysis, assessment criteria and indicators (work in progress)

Basic Governance Function (Tier 1)	**Specific Governance Function (Tier 2)**	**Assessment Criteria** (to be tailored to regional context)	**Indicators** (to be tailored to regional contexts)
Information-sharing	Consultation, collaboration, information flow across actor groups	Degree of collaboration & consultation	Collaboration culture with industrial networks/PPP
			Collaboration with univ. and research institutions
			Presence of cluster organisation
			Collaboration with Horizon/CBI-JU
		Public support & acceptance	Public support & acceptance
	Accountability, transparency, certification and award schemes	Monitoring and reporting	Monitoring and reporting on the bio-based economy in place
		Certification and sustainability labels on BBPs	Certification and labels explaining footprints
	Coordination, cooperation & multi-level governance	Multi-level collaboration (vertical integration)	Interministerial cooperation
			Exchange formats established

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		Interregional cooperation (horizontal integration)	Interregional cooperation
Rule-setting	(Regional) Policy incentives	Public procurement for BBPs	Bio-based criteria in public tenders
			Volume of public procurement of BBP
		Tariffs, taxes or subsidies supporting demand for BBPs	Volume of demand generated by incentive structures
	(Regional) Policy regulation	Interregional laws and regulations (in support/obstacles)	International laws and regulations (no. & qualitative description) in support/obstacle
		Trade policies (in support/obstacles)	Trade policies (no. & qualitative description) in support/obstacle
	(Regional) Strategy and regional linkages	Strategies with bio-based economy focus	No. of strategies with bio-based economy focus
		Complementarity with other sustainable topics and regionally mandated policies	Linkages of bio-based economy with other regional planning topics (no. & description)
Implementation & finance	Finance & investment	Funding for bio-based companies	Volume of public/private funds accessed by BB

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		Availability of private/public funding	Volume of public/private funding available
	Innovation, employment & value added	SME landscape and birth rate	SMEs per sector
		Sustainable management structures	Employment per sector
		Value added (total / per sector)	Value added (total/per sector)
		Employment structure (per sector)	Sustainability credentials/standards (different actor groups)
	Biomass & land use availability	Local biomass availability / production	Local biomass production (total and per sector)
		Land-use patterns	Total land area
			Forestry land/density
			Agricultural and horticultural density
			Organic farming (rate)

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