Deliverable 2.2

Interactive Visual Value Chain Facilitation Tool

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Abstract	The value chain facilitation tool utilises value chains and biomasses identified in BBC WP2. It serves as an interactive visual tool for workshops, enabling participants to identify value chains and evaluate social, economic, ecological, and regulatory impact factors, and assess the availability or absence of technology. Moreover, the tool assists in identifying opportunities for integrating elements into a circular value chain concept.
Keywords	BlueBioClusters, blue bioeconomy, value chains, sustainability, business development, start-ups, facilitation, workshop, carbon-neutral, circular

HISTORY OF CHANGES		
Version	**Publication date**	**Changes**
1.0	31.07.2023	Initial version

Table of Contents

List of Figures

List of Tables

Acronyms

BBC	BlueBioClusters
WP	Work Package
VC Facilitation Tool	Interactive Visual Value Chain Facilitation Tool
PP	Project Partner

How to Use the Guide

To effectively use this VC Facilitation Tool, the facilitators start with the Executive Summary for a brief understanding of its content. Then, familiarise themselves with the About the VC Facilitation Tool section to understand the tool's purpose and structure. Once they are comfortable with the tool's purpose, they explore the Terminology and Tool Components section to comprehend the specific terms and components used throughout the document.

As an option, the facilitator could delve into the About Value Chains section to be prepared for general questions about value chains in the blue bioeconomy. It provides foundational knowledge about value chains and their application to the blue bioeconomy. As they further their understanding of value chains, it will be essential to review the Preparatory Steps section for a successful workshop flow. It offers guidance on time management and logistical considerations in in-person and online workshops.

The heart of this guide lies in the VC Facilitation Tool Modules section. It details five modules, each containing a different activity for facilitating understanding and discussion of blue value chains. For each module, the facilitator should carefully read through the Action, Workshop Participants, Workshop Facilitator, and Question Selection subsections to understand how to execute the module effectively.

Regarding module implementation, the facilitators follow the detailed instructions provided for each and implement the modules in sequence, starting from Module 1: Value Chain Quiz and followed by Module 2: Blue Value Chain Identification. While module 2 is the prerequisite for all subsequent modules, Modules 3-5 could be applied independently. They should utilise the Question Selection sections for each module. They are designed to stimulate outcomes, meaningful discussion, and critical thinking during the workshops.

Furthermore, the Annexes section is an excellent resource for additional support. It includes checklists for setting up online and in-person workshops and a printable collection of questions and boards for different modules. For further reading or to verify the sources of information provided in the guide, you can consult the References section.

This guide is designed to be flexible, so while it's generally best to follow the sequence of the modules, it can be adapted to meet your specific needs and context during your workshops. As facilitators prepare and implement the workshops, regularly referring to the relevant sections of the guide will ensure they make the most of the VC Facilitation Tool.

Executive Summary

The Blue Bioeconomy, defined as the production and conversion of renewable marine biological resources into value-added products, such as food, feed, bio-based products, and bioenergy, entails many opportunities for European coastal communities. Innovative business models based on circularity concepts, short value chains, digital solutions and ecosystem contributions offer the chance to stabilise and create new enterprises and jobs for the lower educated while transforming remote, rural areas into interesting, revitalised, climate-friendly places to live. However, blue bioeconomy actors struggle with challenges related to technology, lack of knowledge, and skills or regulatory barriers. Therefore, we designed the Interactive Visual Value Chain Facilitation Tool (hereafter referred to as the VC Facilitation Tool) to support the development of the blue bioeconomy.

This VC Facilitation Tool is a powerful resource to identify and analyse and enhance the efficiency of value chains. The linear value creation starts with the input biomass, following several steps in between until the consumable product. These steps represent the value chain path. By supporting and mapping out the different elements, stages and actors involved in blue value chains, the results provide insight into bottlenecks, gaps, and areas for improvement and potential matchmaking. More specifically, the outcomes will foster an understanding of the blue bioeconomy sector by determining opportunities and risks of economic, ecologic, social, regulatory, technological and circularity factors. The latter represents a crucial point in developing a circular blue bioeconomy in the Baltic and North Sea until 2030. The circular approach is more complex because most blue and green value chains are still linear in practice, with one start and one endpoint. Still, it could also lead to a higher added value in terms of, for example, waste reduction, energy efficiency and many more aspects mitigating climate change, environmental degradation, and pollution. Furthermore, it requires coherent practices by all actors across the value chain.

An interactive visual format of the value chains ensures the successful engagement of stakeholders from established industries and emerging sectors to draw their path through a value chain. The active work on value chains within workshops allows stakeholders from different blue bioeconomy sectors and European regions to collaborate effectively, make informed decisions, and optimize the performance of the value chain from a sustainable point of view.

1 About the VC Facilitation Tool

The Interactive Visual Value Chain Facilitation Tool (VC Facilitation Tool) is based on value chains and six biomasses identified within the nine regions of the BlueBioClusters (BBC) project. The VC Facilitation Tool was developed for workshop moderators and facilitators to engage multiple stakeholders by facilitating workshops within the BBC project and beyond.

It comprises several VC tool boards based on six specific biomasses with biomass boards and identification boards. The latter serves as a workspace for participants. While these are the most relevant boards, others were developed for support. Section

1.1 Terminology and Tool Components describes all boards in more detail (Biomass boards, Identification boards, Element boards, Module Description Boards).

Besides the boards, the VC Facilitation Tool consists of five modules with different work tasks for participants. Module 1 is a quiz where participants will be involved in a guessing activity to get familiar with the VC tool boards by analysing the value chain and visualising its structure. In module 2, users identify and allocate chain links of one or more value chains based on specific biomasses. Impact points in modules 3, 4 and 5 identify impacting factors of specific value chain links, each referring to a topic (economic, ecologic, social, regulation, technology, and circularity).

Figure 1 on the next page gives an overview of the VC Facilitation Tool modules and the application options:

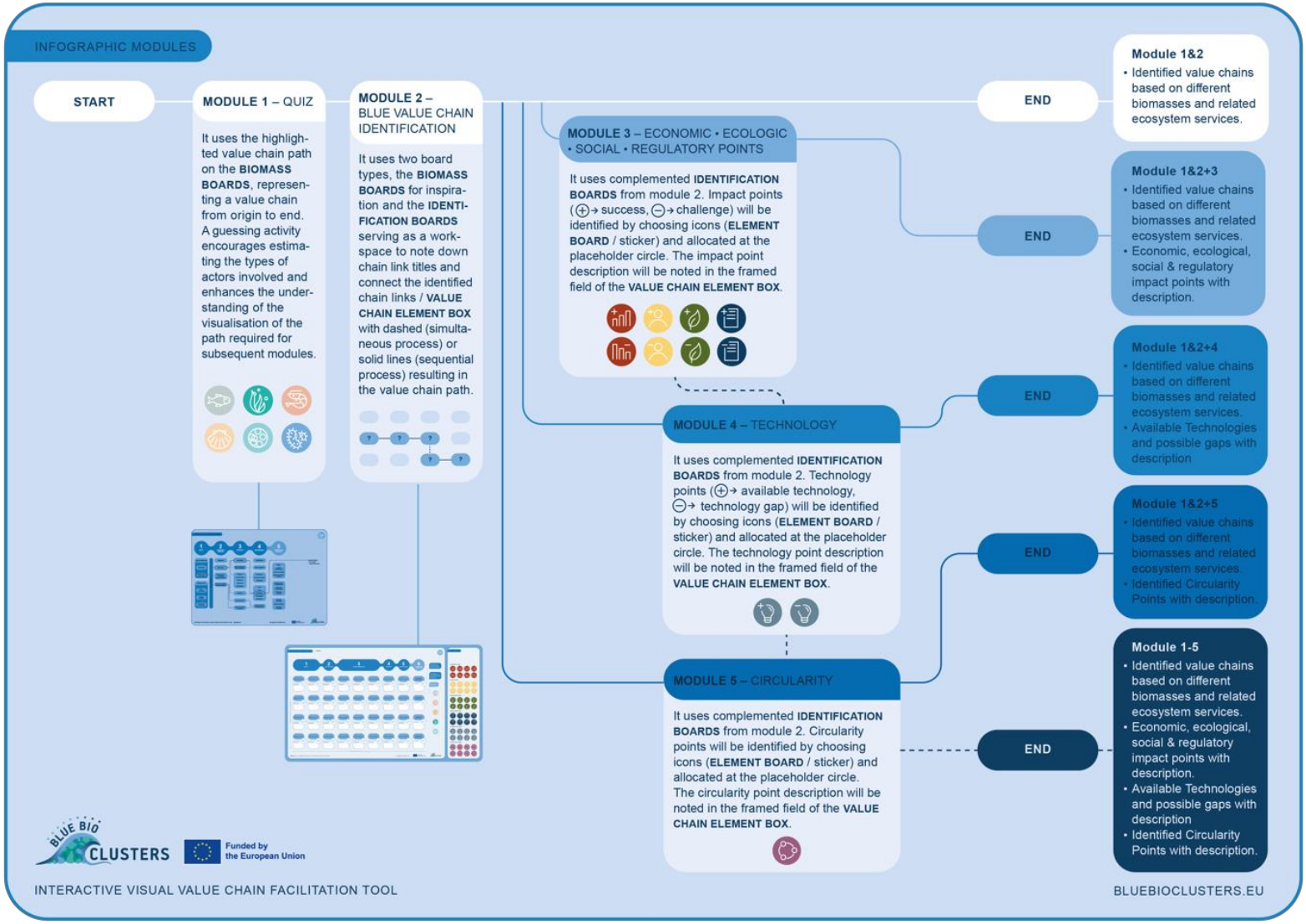

Figure 1 Overview Modules VC Facilitation To

1.1 Terminology and Tool Components

This section provides a comprehensive list and description of all elements and boards of the VC Facilitation Tool and their respective purposes (Annexe 6.6).

Master Miro Board: The Master Miro Board is the compilation of all VC tool boards and is available under this link: Master Miro Board. The VC Facilitation Tool consists of 6 biomass boards and 24 Identification boards. Each biomass board consists of 4 identification boards. Each identification board is linked with one element board. All boards are exportable in PDF format, empty before and with results after the workshop (Annexe 6.6). It also comprises all links for upcoming workshops to be used by workshop facilitators. The Workshop Board links are the prerequisite to start with an empty board. Every workshop will begin with an empty board to be filled out by individual participant groups. Each link is in a blue box where the moderator will give information about the workshop's name and the region where it took place. After the workshop moderators have filled out the box, they change its colour to indicate that this specific VC Facilitation Tool link can't be used for future workshops (Figure 2).

Workshop Miro Board: The Workshop Miro Board refers to the specific link for one workshop – the yellow field in Figure 2.

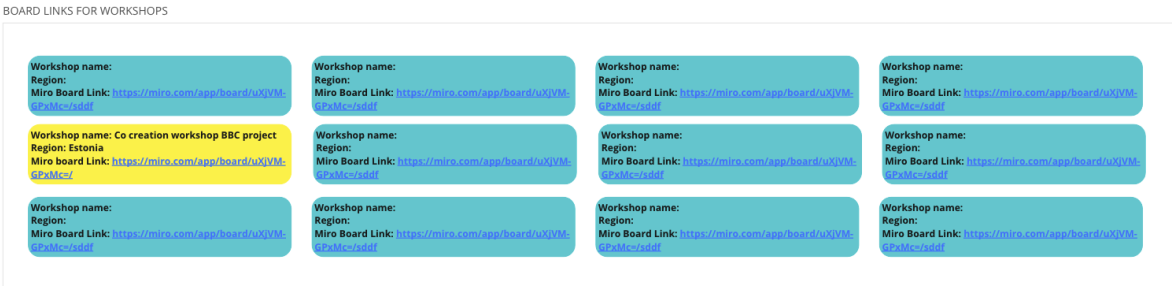

Figure 2 Frame for New Workshop Links on Master Miro Board

Biomass Board: The VC Facilitation Tool comprises six biomass boards (Fish, Bivalves, Microalgae, Macroalgae, Crustaceans, and Marine Bacteria). Each biomass board is connected to four identification boards. The boards showcase BBC's collection of value chain links per stage and interconnected ecosystem services.

Identification Board: The VC Facilitation Tool provides four identification boards per biomass as a workspace for participants (1 biomass board is linked to 4 identification boards. This gives in total 24 identification boards). The identification boards display the same structure as the biomass board but show empty value chain element boxes (described below) serving as digital or printed worksheets to identify and draw the paths of value chains. Participants use lines/arrows to connect the identified value chain links to illustrate their specific value chain path.

Value Chain Links: The chain link of a value chain is one part of the value chain element box. Participants define one or more chain links depending on the value chain stage.

Value Chain Stages: The six value chain stages were developed within the BBC project to visualise value chains. Starting with stage 1, Input represents resource input. Stage 2, Cultivation, describes the cultivation method and related processes, and stage 3, Transformation, lists processing methods to fragment the biomass. While Stage 4, Product, lists the end products, Stage 5, End Market, describes the possible market sector. The last stage (6), Ecosystem Services, is a separate category listing the interconnected ecosystem services with the value chains. While stage 6 is not directly linked to a specific value chain link, it is interrelated to all processes and side effects within the value chains. The amount and categories of value chain stages can differ depending on their definition. The VC Facilitation Tool defines the value chain stage based on BBC results.

Value Chain Element Box: This box represents one part of the identification board workspace. Each value chain stage consists of one empty value chain element box. It comprises three components. One-third of the box is a coloured cell on top of the value chain element box to add the chain link title and to connect the identified chain links of a specific value chain (in module 2). The other part box is a framed field that gives space for describing the impact points allocated by participants in the placeholder circle at the framed line on the left. The last value chain stage, the ecosystem service, also included in this structure, gives space to add and describe the interconnected ecosystem services.

Element Board: The element board is the supporting tool for online workshops. The illustrated impact icons are duplicates supporting participants in accomplishing module 3-5 tasks without duplicating the icons on their own. They are moveable and will be allocated to the placeholder circle on the identification board. Participants of in-person workshops use stickers based on the PDF file (ANNEXE 6.7) or recommended tools (Table 2)

Module Description Board: This board is used as a legend and briefly describes all module tasks and the boards per module.

Impact Icons: The impact icons are on the element board next to each identification board. The identification board comprises the circle placeholders to allocate the icons to a specific value chain link of a particular stage. The impact icons include six topics: economic, ecological, social, regulatory, technology and circularity. The following four topics are used in module 3: economic, ecological, social, and regulatory and serve as an interactive tool to identify and locate positive or negative impacting factors in the value chain. The icons with a plus represent success points, and the minus indicates challenges. The other two categories are listed below.

Technology Icons: The technology icons are marked with a minus representing a technology gap, and a plus indicating an available technology. The icon will be moved to the circle placeholder on the identification board.

Circularity Icon: The circularity icon is unique and indicates the potential of a chain link in the value chain path to be a potential element for a circular value chain approach. The icon will be moved to the circle placeholder on the identification board.

Circular Value Chain Concept: The circular value chain concept is based on the principles of the circular economy, which aims to minimize waste, maximize resource efficiency, and promote sustainability. In a circular value chain, products and materials are managed in a closed-loop system, where they are continuously reused, recycled, or repurposed. Unlike traditional linear value chains, which follow a linear path from raw material extraction to disposal, the circular value chain emphasises the reduction of resource consumption, the extension of product lifespan, and the recovery of materials at the end of a product's life cycle.

1.2 Target Users of the VC Facilitation Tool

The target users for the VC facilitation tool are primarily workshop organizers in the blue bioeconomy sector. The tool can be applied to a diverse target group comprising, i.e., the following stakeholders: academia and industry, companies and entrepreneurs, blue farmers and aquaculturists, technology providers, business support organizations, NGOs, public authorities, policymakers, and regulatory bodies.

1.3 Objectives and Expected Outcomes of the VC Facilitation Tool

The VC Facilitation Tool was developed to engage relevant stakeholders in the blue bioeconomy sector to identify, collect and analyse gaps and opportunities in blue value chains. The results will foster co-creation to solve challenges identified in the workshops. Moreover, they increase their contribution to the development of a circular, carbon-neutral, and sustainable blue bioeconomy in Europe.

The VC Facilitation Tool will be applied in BBC workshops organised in work packages (WP) 4, 5, and 6 to facilitate the understanding and engagement of stakeholders. In WP 4's online workshops targeting technology users, the VC Facilitation tool boosts interaction and supports showcasing/prioritising challenges and availabilities in the blue bioeconomy. Furthermore, the VC Facilitation Tool will help the capacity building co-creation workshops in WP 5 facilitated by project partners (PP) and applied accordingly to include relevant actors from subsector value chains to participate in co-designing solutions, i.e., supporting start-ups/SMEs in overcoming their challenges. In addition, PPs in WP 6 will use the tool or workout results in inter-active workshops with Communities of Practice[1] (CoPs) to identify and discuss opportunities along suitable bio-based value chains, to form collaboration necessary to take them up and to develop skilled jobs and (small-scale) establishments in the blue bioeconomy and helping to revitalise local communities. In addition, the results derived through the VC Facilitation Tool will also be used to develop the BBC project's case studies in WP 2.

In general, it intends to support workshop participants in identifying the most suitable set of value chains, impacting factors, technology gaps/availability and circularity[2]

[1] CoPs bring together interested regional (sub-national) blue bioeconomy actors (blue biomass producers, processing and ancillary public and private companies/users, NGOs, policy makers, educators

[2] The circular value chain concept is based on the principles of the circular economy, which aims to minimize waste, maximize resource efficiency, and promote sustainability. In a circular value chain, products and materials are managed in a closed-loop system, where they are continuously reused, recycled, or repurposed. Unlike traditional linear value chains, which follow a linear path from raw material extraction to disposal, the circular value chain emphasizes the reduction of resource consumption, the extension of product lifespan, and the recovery of materials at the end of a product's life cycle.

potential for their regional context. The results of BBC workshops will provide policymakers, planners, project developers, investors, innovators, start-ups, and established businesses with relevant insights about the regional status of a given sector. The VC Facilitation Tool, when deployed regionally, will serve as a repository of regional value chains in Europe to be compared and explored in terms of improvement for effective pan-European knowledge transfer and collaboration. Depending on the workshop type (online, in-person), the results will be available online or in a printable PDF version. The repository of identified specific value chains and impacting factors in several EU regions will be publicly available for all participants of the workshops and on BBC media channels.

The expected outcomes after applying the VC Facilitation Tool in a workshop are collections of:

- Fully Identified value chains based on six biomasses within Europe.
- Identified gaps within the value chain, if existing.
- Specific ecosystem services linked to value chains.
- Social factors impacting regional communities.
- Ecologic factors per value chain stage.
- Economic factors per value chain stage.
- Regulatory constraints.
- Available technology and gaps.
- Circularity potential per value chain stage.

The figure on the next page shows the outcomes based on the applied module combination and where they will be used further within the BBC project and beyond.

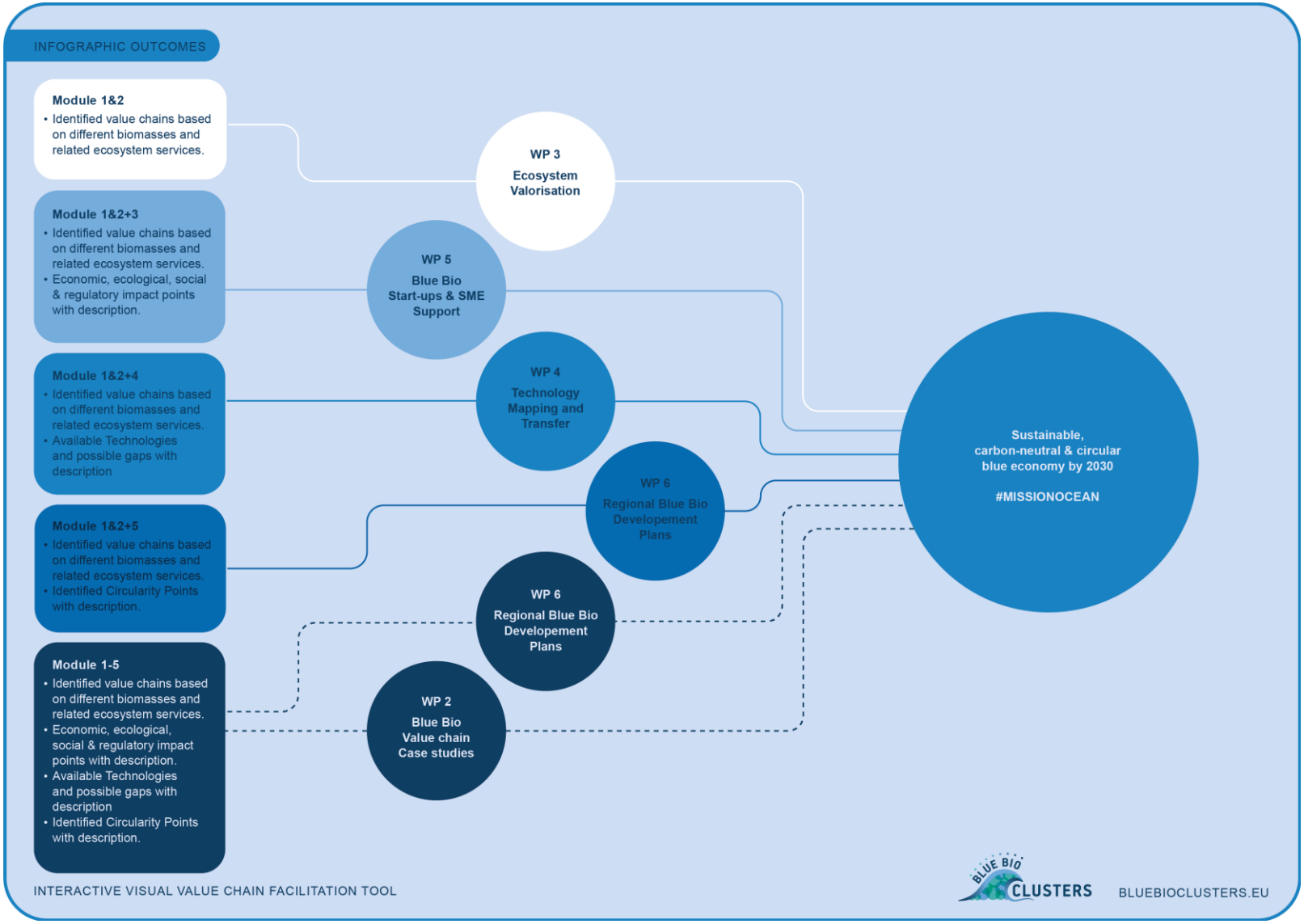

Figure 3 Infographic Outcomes and WPs

2 About Value Chains

2.1 What is a value chain?

A value chain encompasses a variety of activities essential for taking a product from its initial resource/development to the end consumer. This involves a sequential process that includes physical transformations, integrating different producer services, and appropriate disposal methods once the product has been used. (Kaplinsky and Morris, 2000).

2.2 Blue bioeconomy value chains

Value chains in the blue bioeconomy refer to the series of interconnected activities and actors involved in developing, producing, and distributing products and services derived from marine resources. These value chains encompass the entire lifecycle of marine-based products, from resource extraction or cultivation to end-user consumption or disposal.

The value chain in the blue bioeconomy typically includes the following stages:

1. **Resource Harvesting or Cultivation**: This stage involves fishing, aquaculture, or seaweed farming, where marine organisms or biomass are harvested sustainably or cultivated for further processing.

2. **Primary Processing:** After harvesting or cultivation, the raw materials undergo primary processing, including cleaning, sorting, and initial preservation, to prepare them for further refinement.

3. **Extraction and Conversion:** In this stage, specialised techniques such as biotechnology or biorefining are employed to extract valuable compounds, modify them, or convert them into intermediate products. This may involve processes like enzymatic hydrolysis, fermentation, or chemical transformations.

4. **Secondary Processing:** The intermediate products obtained from the extraction and conversion stage are further processed and refined to enhance their quality, purity, or functionality. This could involve activities like separation, purification, concentration, or formulation.

5. **Product Manufacturing:** Refined materials are used to manufacture final products or bio-based materials that can be utilised in sectors such as food and beverages, cosmetics, pharmaceuticals, biofuels, or bio-based materials for industrial applications.

6. **Marketing and Distribution:** Once the products are manufactured, they are marketed and distributed through various channels to reach end consumers. This includes branding, packaging, logistics, and establishing distribution networks.

7. **Consumption and "end of life":** The final stage of the value chain involves the consumption of blue bioeconomy products by end users. It also considers the appropriate disposal or recycling of waste and by-products, adhering to sustainable practices and circular economy principles.

Throughout these stages, different actors, such as producers, biotechnology companies, processing and manufacturing firms, research institutions, government agencies, investors, marketing channels, and consumers, collaborate to create a sustainable and efficient blue bioeconomy value chain.

3 VC Facilitation Tool User Guide

The subsequent sections provide a more detailed overview of the VC Facilitation Tool encompassing components and guidelines for facilitators and workshop participants.

To best use the VC Facilitation Tool, workshop organisers should undertake preparatory steps as indicated in the following paragraph. While the VC Facilitation Tool is suitable for both online and in-person workshops, adapting it to hybrid formats necessitates specific preparation of the online and in-person components. For this scenario, two moderators are needed to provide guidance to the online and in-person participants, respectively. Given the above, the hybrid format is not recommended.

The subsequent sections outline the preparatory steps and equipment for each workshop type.

3.1 Preparatory Steps

To ensure adequate workshop preparation, it is beneficial to identify stakeholder groups in advance. By clustering participants in advance, the workshop can be customised with the interests and goals of each group, leading to more productive and targeted sessions. The amount and type of biomass boards (ANNEXE 6.6) that will be used can be determined based on the expertise and background of the participants. It will be essential to determine the baseline knowledge of the group before running a workshop to ensure the information provided is appropriate. As a recommendation, at least one expert in the field should be invited to every workshop by organisers to guarantee a smooth and engaging workflow. If clustering participants is not feasible beforehand, and the targeted choice of a specific biomass board is not possible, the following guidelines provide advice (for example, Slido poll-word cloud, chat query, voting corner on the Workshop Miro board) that can be applied at the beginning of the workshop to set the scene.

The techniques and resources are designed to create an inclusive and engaging atmosphere, enabling participants from diverse backgrounds to collaborate effectively and maximize the workshop's outcomes.

In general, preparation is crucial to ensure smooth and productive sessions. The workshop facilitator must decide whether the workshop will be online or in-person. Both online and in-person workshops have their merits and drawbacks, and the choice between them depends on the specific goals, audience, and resources available for

the event. Hybrid approaches, which combine elements of both online and in-person workshops, are also becoming increasingly popular as they offer the benefits of both formats while mitigating some of their respective limitations. A hybrid format is not recommended for the FC Facilitation Tool.

Advantages of Online Workshops	**Advantages of In-Person Workshops**
Accessibility: Online workshops offer greater accessibility to participants from different geographic locations. People can join from anywhere with an internet connection, reducing the need for travel and associated expenses.	Face-to-Face Interaction: In-person workshops facilitate direct and personal interaction between participants and facilitators, fostering better communication and a sense of community.
Flexibility: Participants can engage in online workshops conveniently, accommodating various time zones and busy schedules. This flexibility allows for more diverse and inclusive participation.	Immediate Feedback: In-person workshops allow for real-time feedback and interaction, enabling facilitators to adjust their approach and content based on the participants' reactions.
Cost-Effectiveness: Online workshops often require fewer resources and overhead costs than in-person events. There are no expenses for venue rentals, catering, or printed materials, making them a cost-effective option.	Networking Opportunities: Participants in in-person workshops have more opportunities for networking and building professional relationships with others in the same field.
Disadvantages of Online Workshops	**Disadvantages of In-Person Workshops**
Technology Challenges: Technical issues, such as internet connectivity problems or software glitches, can disrupt the flow of online workshops and lead to participant frustration.	Travel and Logistics: In-person workshops require participants to travel to the event venue, incurring travel expenses and potential scheduling conflicts.
Reduced Interaction and Engagement: Online workshops may lack the same level of personal interaction and engagement as in-person events. Participants may feel less connected to the facilitator and other attendees.	Limited Reach: In-person workshops may have a limited reach, as participants are restricted by geographic location and may not be able to attend due to time or travel constraints.
Distractions: Participants in online workshops may face distractions from their surroundings, potentially impacting their focus and attention during the session.	Higher Costs: In-person workshops often involve higher costs associated with venue rentals, catering, and printed materials, making them less cost-effective than online workshops.

Table 1 Online vs In-person Workshops

The following section lists the critical steps for the workshop preparation.

3.1.1 Time Management

The VC Facilitation Tool application of all modules requires approximately 2-5 hours, including the introduction and all workshop activities. The tool is designed to include a break between the different modules, if necessary. The schedule should be communicated to participants in advance so that they know the workshop's structure and are ready to commit time and effort to the workshop.

3.1.2 In-person Workshops

Facilitator preparation: Facilitators familiarise themselves with the VC Facilitation Tool and read the guidelines to offer clear guidance to participants. The workshop facilitators must decide how to apply the modules (Figure 1).

The Master Miro board is available at Master Miro Board. Workshop moderators download the material directly from known sources (ANNEXE 6.6). The sticker sheet must be sent to a printing company in advance, or the workshop responsible orders/buys round marker stickers with the same or similar colours as in the element board (see table 2, ANNEXE 6.7)

Venue setup: Select a suitable venue that can comfortably accommodate the number of participants selected.

Seating arrangements: Tables allow enough space to draw on an A3-sized board.

Equipment and technology: Projector/screen to show the biomass board/master Miro board. Test and ensure all equipment, internet connectivity, and other necessary technologies work correctly.

Materials and resources: The preparation of markers, boards, and stickers must be organised in advance. The table below lists all relevant print materials based on the applied module combination.

Marker: Two types of markers should be used, one with a minimum size of 2 mm for flip charts and the second type with a size of 1 mm available for each participant.

Boards: Depending on which modules will be applied, the facilitator prints all boards or a selection. The selection could either be based on the topic of interest derived from the clustering process of participants or decided by the workshop facilitators.

Sticker: For in-person workshops, either the sticker sheet (ANNEXE 6.7) must be sent to a printing company, or stickers could be ordered (example: LINK).

Applied Modules	Module Names	Materials Available	Example Materials for a Workshop
MODULE 1&2	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3)	1x Biomass board 4x Identification boards
MODULE 1&2+3	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 3 ECONOMIC • ECOLOGIC • SOCIAL • REGULATORY POINTS	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 24x Sticker sheets/amount based on the selection (A4) xx Ordered stickers: circle, 4 colours, 1,5-2 cm diameter	2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker per colour (80x4 colours) (20 per colour and identification board)
MODULE 1&2+4	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 4 TECHONOLGY	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 24x Sticker sheet per identification board (A4) xx Ordered stickers: circle, 1 colour, 1,5-2 cm diameter	2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker (20 per identification board)
MODULE 1&2+5	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 5 CIRCULARITY	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 24x Sticker sheet per identification board (A4) xx Ordered stickers: circle, 1 colour, 1,5-2 cm diameter	2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker (20 per identification board)
MODULE 1-5	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 3 ECONOMIC • ECOLOGIC • SOCIAL • REGULATORY POINTS 4 TECHONOLGY 5 CIRCULARITY	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 24x Sticker sheet per identification board (A4) xx Ordered stickers: circle, 6 colours, 1,5-2 cm diameter	2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker per colour (80x6 colours) (20 per colour and identification board)

Table 2 Print Material needed for In-person Workshops

3.1.2 Online Workshops

Moderator preparation: The facilitators familiarise themselves with Miro functionalities and the tool modules and read the guidelines to guarantee an adequate explanation for participants. These steps ensure a confident and well-prepared facilitation that can effectively guide participants throughout the tasks and the workshop.

Equipment and technology: Test and ensure that internet connectivity functions correctly.

Materials and resources: Prepare all required materials and resources in advance.

Master Miro board: The board comprises a frame, Board Links for Workshops with boxes. In each box, a field for the workshop name and the region where to workshop took place must be filled out by facilitators. They use the link in the filled-out box for

their workshop. A new box must be filled out whenever a new workshop occurs, and a new link will be used. (Master Miro Board)

Links to be shared with participants: one specific Miro board link. (The facilitators must choose one link in the Master Miro board!!)

Optional: Slido poll or voting corner on the Workshop Miro Board to decide which biomass board most participants want to use during the workshop.

3.2 VC Facilitation Tool Modules

This section gives instructions to support workshop facilitators in introducing the modules to participants. Each module description is structured in the same way. While this first part briefly describes all modules, the module sections describe the activity in more detail.

The starting point is Module 1, where participants follow the highlighted value chain on one specific biomass board. Ultimately, participants guess the number of actors involved in the value chain. In the second module, participants work on identification boards of specific biomasses. They define their value chain links by writing a term in the box. After this step, the participants link the chain elements from Input to the End Market on a vertical and horizontal dimension. In module 3, the value chains from the former are the prerequisite for identifying ecologic, social, and regulatory impact points. The moderator steers the outcomes of all modules with targeted questions. Module 4 was developed to identify available or missing technologies in the value chain. The last module serves as an identification tool for circularity points.

Module 1 Value Chain Quiz

Module 1 is an interactive activity designed to help participants understand the visualised value chain structure of the biomass boards. The activity involves the biomass board of chosen biomasses. The highlighted path represents the journey of the biomass product from its origin to the final stage. The facilitator guides participants through the value chain and engages them in a guessing activity. They are asked to estimate the type of actors involved in the entire value chain of the specific biomass product.

The highlighted value chain path of, for example, the Bivalves Biomass Board (Figure 4) show the following link chains:

Input: Substrate and material

Cultivation: Cultivated, Seabed cultivation

Transformation: Harvesting, Cleaning/Shucking

Product: Whole Bivalve

End Market: Food

Each chain link is marked with a bold frame. They are connected with a solid line indicating processes occurring one after another (horizontal time dimension) or a dashed line representing the vertical time dimension indicating simultaneous processes.

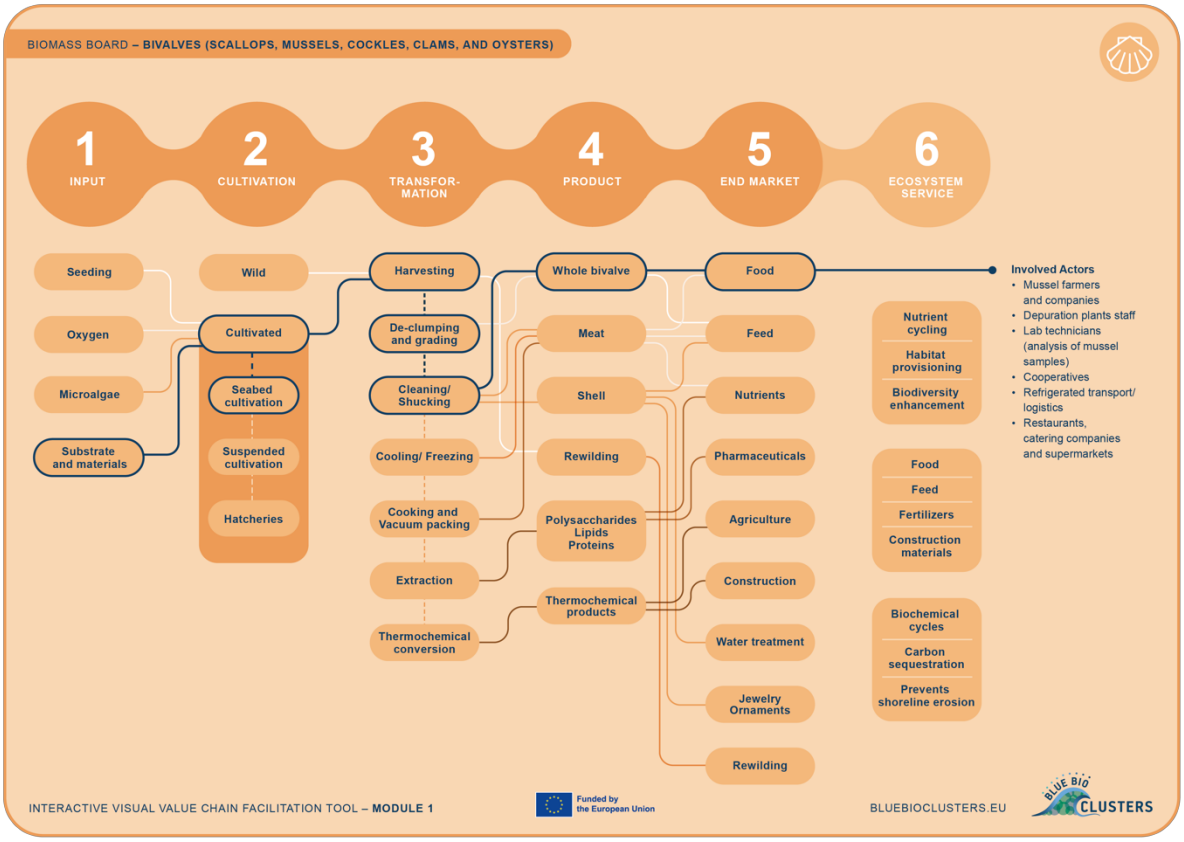

Figure 4 Bivalves Biomass Board with Highlighted Value Chain

Module 1 serves as a foundational activity setting the stage for deeper discussions and learning in subsequent modules. The guessing activity can already spark conversations among participants about the diversity of stakeholders and accompanying challenges. It also highlights the interdependence of various actors and emphasizes the need for collaboration and responsible practices in the blue bioeconomy.

Action (Module 1)

Duration: In total 40-50 minutes | Introduction 10 minutes | Module 1 task 10 minutes | Results & discussion: 20-30 minutes

Goal: Find out which actors are involved in the highlighted value chain.

Task: Participants will be guided by the workshop facilitator through the five existing value chain stages. Stage six requires a specific explanation in advance. The value chain is based on highlighted value chain links and their linear path, all located in the middle of each biomass board. The moderator guides participants from stage 1 to

stage 5 and explains at the end why ecosystem services are included in this approach. Including ecosystem services in the respective value chain is relevant to analyse indirect factors. They ask participants which actors might be involved. Input from participants is collected. The involved actors of the highlighted value chain can be displayed (on the Miro board) or described by the workshop moderator. After showing the results, workshop moderators could encourage participants to start a discussion[3] based on module 1 questions (Annexe 6.1).

By following the value chain path and analysing the value chain stages, participants get familiar with the overall concept of how the value chains are illustrated on the biomass boards. This is a preparatory step to work on the identification boards in module 2.

The Macroalgae Biomass board below shows in dark blue the highlighted value chain and the involved actors on the left corner of the board.

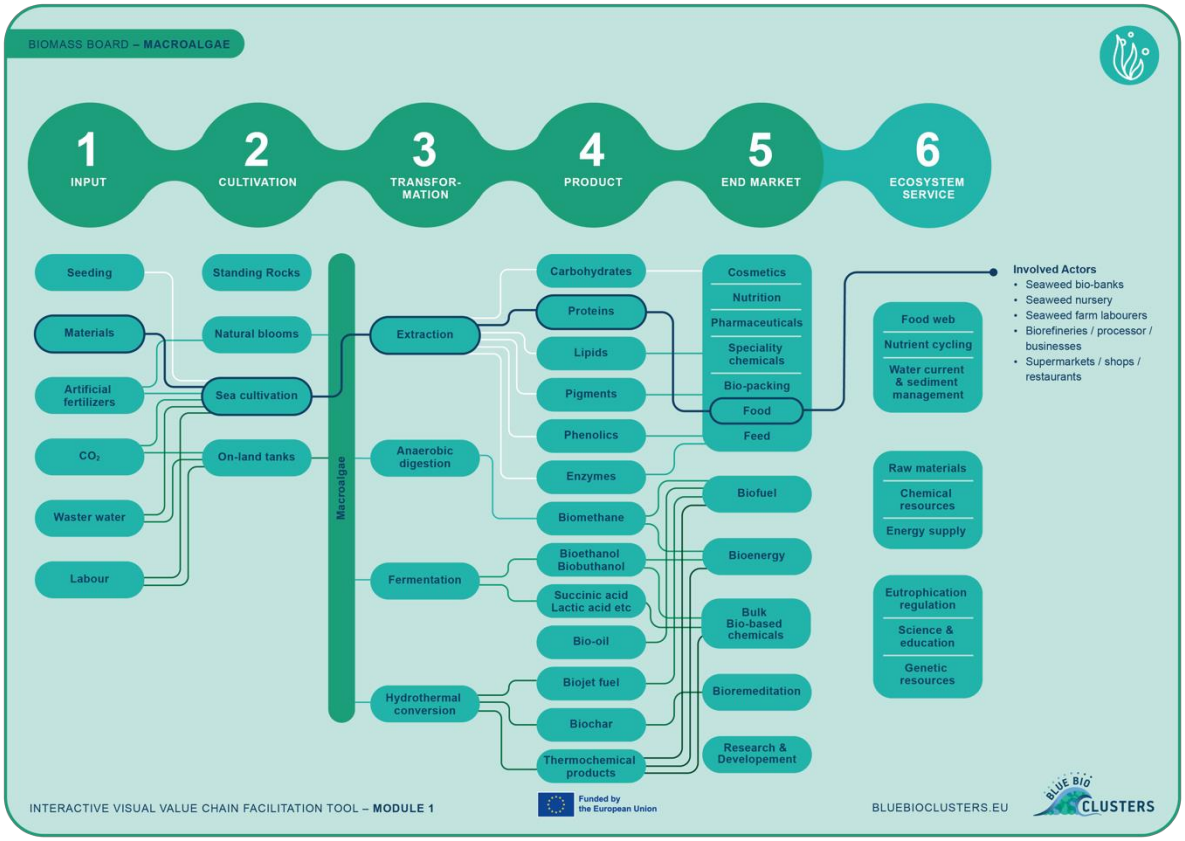

Figure 5 Example Biomass Board Macroalgae for Module 1

[3] Discussions among participants about the diversity of stakeholders and accompanying challenges. It also highlights the interdependence of various actors and emphasizes the need for collaboration and responsible practices in the blue bioeconomy.

Moderator explanation text: Please look to the middle of the board, here you can see five different value chain stages starting with 1. Stage: Input, 2. Stage: Cultivation, 3. Stage: Transformation, 4. Stage: Product, 5. Stage: End Market. Stage 6, the last box, lists ecosystem services that the value chain might impact. While we are following the value chain path to the end, please think about the actors who could be involved in the different stages.

Material and Resources (Module 1)

In-person workshop*:* flip chart, marker, printed biomass board in A3 per group/digital biomass board on the beamer, description of the example/case.

Online Workshop: Link to the Workshop Miro board. (Read section 1.1 Terminology and components, subsection: Master Miro Board)

Workshop Participants (Module 1)

Action: Do & experience.
Task: Find out which actors are involved in the highlighted value chain.
Outcomes: Learning about how the biomass board and the value chains are visualized. This is the preparatory step for working on the other modules.

Workshop Facilitators (Module 1)

Introduces, facilitates, and moderates the exercise to set the required knowledge background information for module 2. They encourage participants in the guessing activity to identify involved actors of the highlighted value chain of a specific biomass.

Question Selection (Module 1)

1. Who are the key stakeholders involved in the value chain of the specific biomass product we examined?
2. How do their roles differ at each stage of the value chain?
3. How does the diversity of stakeholders in the blue bioeconomy impact decision-making, resource management, and sustainability efforts?
4. What are the potential challenges in coordinating actions among different actors?
5. What are some examples of interdependence between various stakeholders in the value chain?
6. How does one stakeholder's action or decision affect others along the chain?
7. In what ways can collaboration between stakeholders enhance the sustainability and social responsibility of the blue bioeconomy?

8. How can we promote cooperation and knowledge-sharing among different actors?

9. What challenges do small-scale or artisanal producers face in participating in the blue bioeconomy?

10. How can we ensure their inclusion and support in sustainable practices?

Module 2 Blue Value Chain Identification

In the second module, participants work on identification boards of specific biomasses. These identification boards are the essential workspace that represents the structure of the value chain path of different biomasses in the blue bioeconomy and includes placeholders for the impact point allocation and description used in the subsequent modules 3, 4 and 5.

The facilitator provides participants with identification boards consisting of a grid with empty value chain element boxes. Only the coloured cells representing a value chain link of a value chain stage will be used in module 2. The participant's task is to define and write down the value chain elements for that specific biomass. Once the participants have filled in the value chain links on their identification boards, they move on to the next step of the activity. They connect the value chain links from the Input stage to the End Market on vertical and horizontal dimensions. On the vertical dimension, participants draw dashed lines/arrows connecting the coloured cells representing the value chain links, starting from the initial input stage to the end market. This vertical linkage visually means the simultaneous processes. On the horizontal dimension, participants draw solid lines/arrows connecting the coloured cells representing the value chain links, starting from the initial Input Stage to the End Market. This horizontal linkage visually represents a sequential process (Figure 7).

The second module sets the stage for further discussions on the complexities, challenges, and opportunities in the blue bioeconomy based on existing regional value chains. In the subsequent modules, participants can explore these by identifying impact points within their value chain.

Figure 6 on the next page shows one identification board of the biomass bivalves representing the workspace for participants. While figure 7 shows a filled-out identification board including all modules activities. In each module section, Figures 9, 10 and 11 show examples of identification boards after participants' module activities.

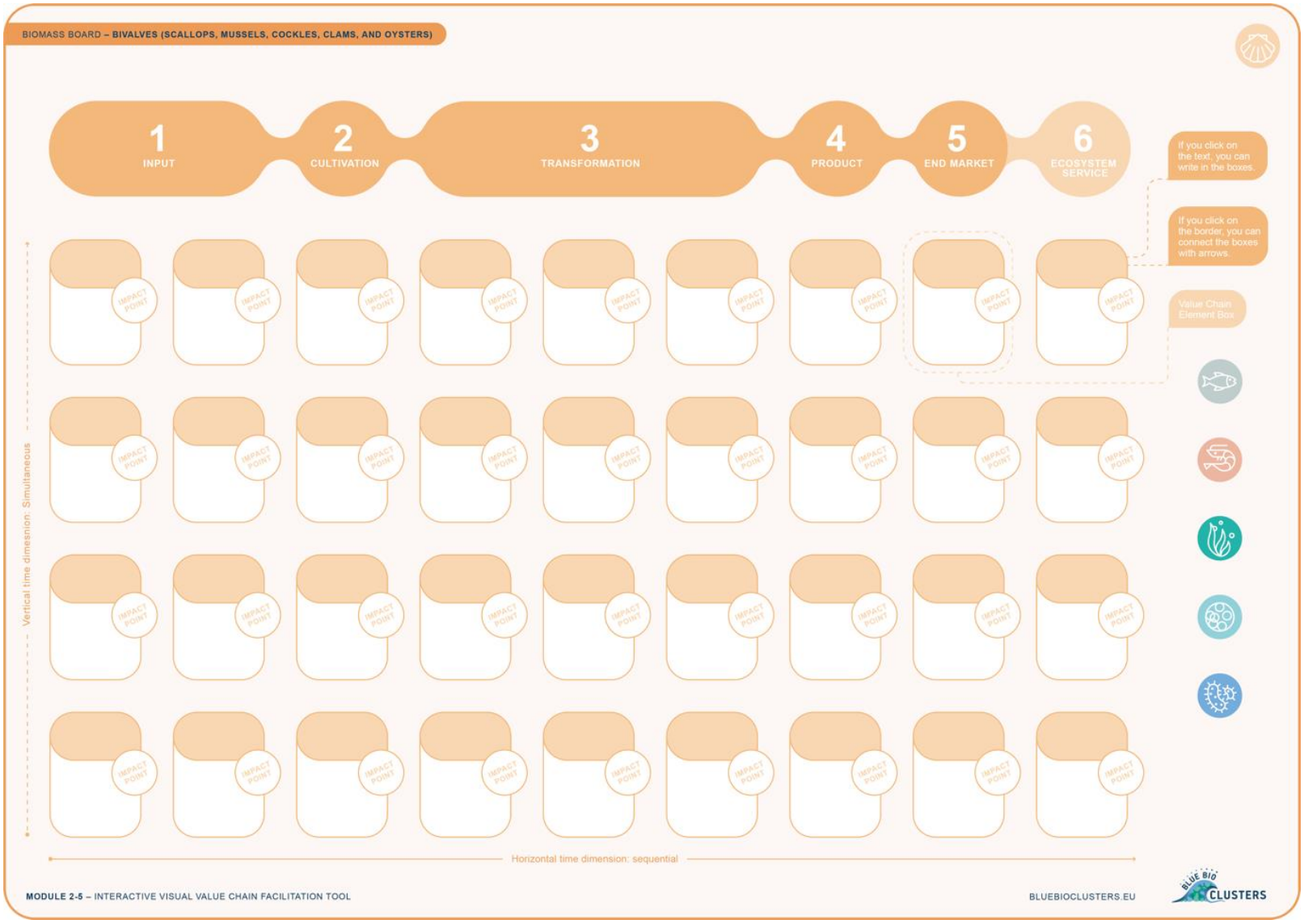

Figure 6 Identification Board Bivalves

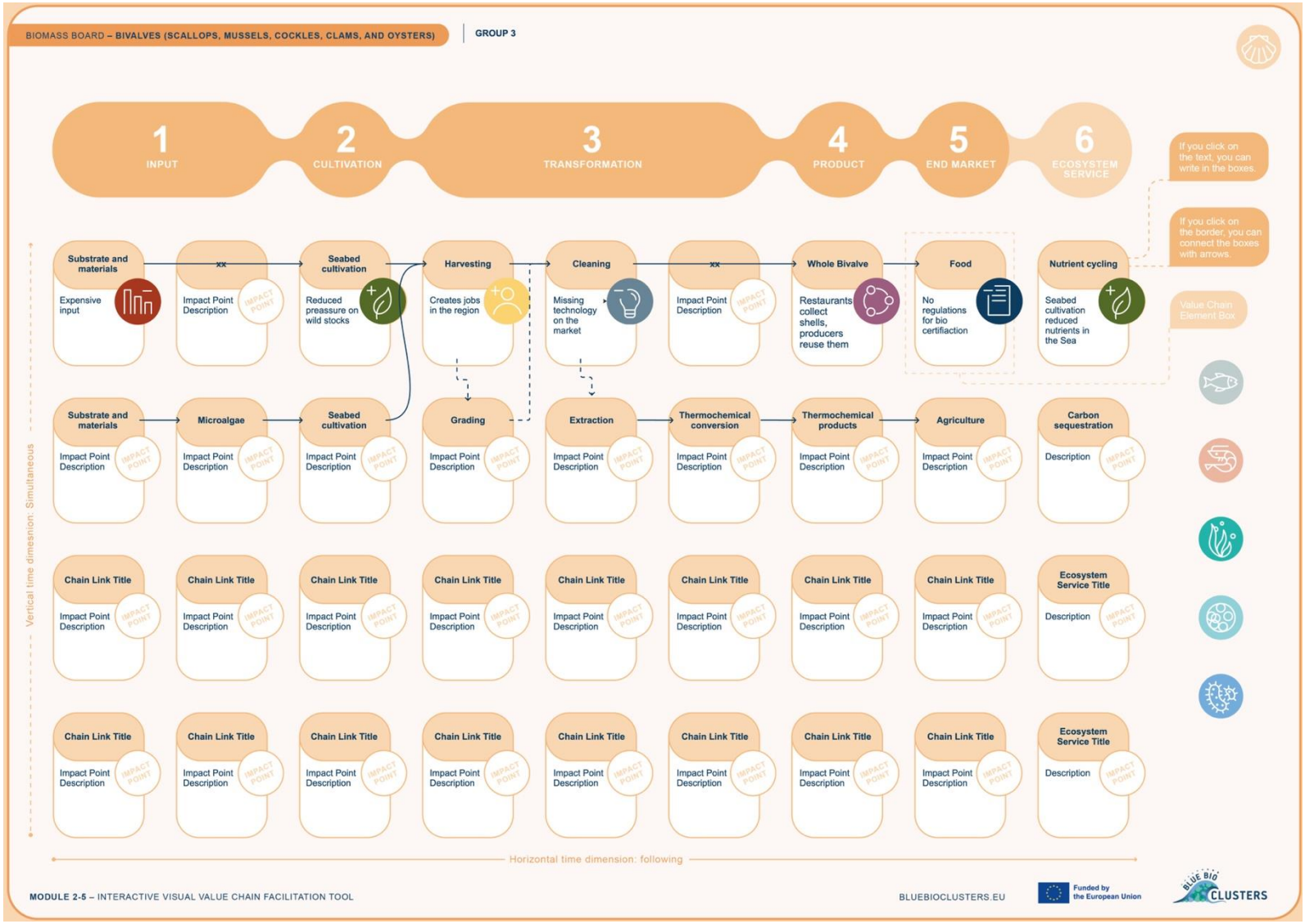

Figure 7 Example Identification Board Bivalves with Results

Action (Module 2)

Duration: In total: 1,5-2 hours | Allocation of participants: 15 minutes | Introduction: 15 minutes | Module 2 task: 30-45 minutes | Results & discussion: 30-45 minutes

Goal: Identify value chain links and possible gaps. Create a path by connecting the links with lines/arrows. (dashed/solid)

Task: The moderator allocates participants. Explains the identification board, the stages (1-6) and the specialities of stage 1 and stage 3, referring to the time dimension and the option to add more than one value chain link per stage. Furthermore, at the end of the exercise, they announce the end time of the activity, summarise, and facilitate a discussion on the outcomes.

The initial phase of both workshops involves participant allocation. The subsequent two paragraphs outline the process for each workshop type, commencing with the choice of the biomass board and the formation of groups, followed by the tasks participants undertake in module 2, and concluding with a summary by the moderator.

Online Workshop

Material and Resources: Master Miro Board, link to Workshop Miro Board, module 2 question selection (Table 2).

Selection of biomass board: The moderator can select how many and which biomass boards participants should focus on if they have gathered knowledge about the participants' expertise before the workshop. At the beginning of the workshop, the moderator can also inquire about participants' preferred biomass and allocate individuals in groups accordingly. (For example, with a Slido poll/ voting corner on the Workshop Miro Board). Voting on the Miro board is possible in the voting corner frame where all biomasses and empty post-its are listed. Participants write their names on the post-its under the biomass they want to work on.

Figure 8 on the next page shows the selection corner on the Master Miro Board.

Figure 8 Biomass Voting Corner on Miro Board

The allocation step is described in the following section.

Allocation: In online workshops, participants work individually, in pairs or in groups of 4 on one/each of the identification boards by filling out the prepared value chain stages. Each group must agree on who will present their results after the exercise.

Task: Each participant or each group will work on the identification boards filling out the value chain links of stages 1 to 6) based on their knowledge and in agreement with other participants in their group. They can write new terms and/or use the terms from the predefined value chains on the biomass board as inspiration (Figure 4). It is also possible to leave boxes empty or write GAP to indicate a gap in the value chain. After identifying the elements of each stage, participants will draw arrows to connect one chain link with the other. A linear path through the identified value chain will be created.

Stage 1 and Stage 3 require particular attention and focus because Stage 1 Input offers the option to add more than one input element. Furthermore, a vertical dimension indicating a simultaneous action or use in time will be shown by drawing a dashed line. Stage 3, Transformation, comprises a horizontal extension of three rows. This allows participants to visualize transformation processes running one after another (sequential). The outcomes will lead to visualised linear value chains, participants can also show interlinkages with other biomasses by drawing an arrow to the biomass icons on the right edge of the identification board.

Wrap-up: After each group has presented their results, the moderator summarises the outcomes and facilitates a discussion, if desired, from the moderator or the participants based on the question selection.

In-person workshop

Material and Resources: Flip chart, marker, printed identification boards per biomass in A3 format, printed biomass board in A3/A4 per group/digital biomass board on the beamer, printed question selection. (Table 2)

Select biomass board: The moderator can select the quantity and specific biomass board before the workshop based on their knowledge of the participant's expertise. At the beginning of the workshop, the moderator can also inquire about participants' preferred biomass and allocate individuals to groups accordingly.

The allocation step is described in the following section.

Allocation: The moderator randomly distributes participants into four groups. Each group will work with black markers directly on the printed identification boards located on each group table. It's recommended to print the biomass boards for each group when more than one biomass was chosen, or in case of one biomass to be shown on a beamer.

Task: Each participant or each group will work on one of the four identification boards filling out the value chain stages 1-6. Either based on their knowledge or agreement when working in a group, they can write new terms or use the subject terms from the pre-defined value chains on the biomass board as inspiration. It is also possible to leave boxes empty or write GAP to indicate a gap in the value chain. After identifying the elements of each stage, participants will draw arrows to connect one chain link with the other. A linear path through the identified value chain will be created. Stage 1 and Stage 3 require particular attention and focus because Stage 1 offers the option to add more than one input element. Furthermore, a vertical dimension indicating a simultaneous action or use in time will be shown by drawing a dashed line. Stage 3 Transformation comprises a horizontal extension of three rows. This allows participants to visualise transformation processes running one after another (sequential). The outcomes will lead to visualised linear value chains, participants can also show interlinkages with other biomasses by drawing an arrow to the biomass icons on the right edge of the identification board.

Wrap-up: After each group has presented their results, the moderator summarises the outcomes and facilitates a discussion, if desired by the moderator or the participants based on the question selection.

Moderator explanation text: In module 2, you will identify (either in groups or on an individual basis) value chains based on the specific biomass selected. This process leads to a linear visualization of the value chain, similar to the highlighted value chain on the biomass board from module 1. In module 2, you will define each link chain of the value chain and connect these with each other. If the value chain can not be completed, it means you have identified a gap in the value chain. After the exercise,

you will have identified and visualized several value chains and ecosystem services interconnected to the processes and activities within the value chain.

You can either use the subject terms displayed in the middle of the biomass board or define your own terminology by writing new words directly in the boxes coloured from light to dark. Each box represents one value chain stage: 1. Stage: Input, 2. Stage: Cultivation, 3. Stage: Transformation, 4. Stage: Product, 5. Stage: End Market. Stage 6 list ecosystem services that the value chain might impact.

Stage 1 and Stage 3 require particular attention and focus because Stage 1, Input, offers the option to add more than one input element. Stage 3, Transformation, comprises a horizontal extension of three rows to add more chain links. This allows participants to visualize transformation processes one after another (sequential). After defining one specific value chain link, you draw the path by connecting the value chain links with arrows. You could show interlinkages with other biomasses by drawing an arrow to the biomass icons on the right edge of the board. In the end, one group member will present the results."

Workshop Participants (Module 2)

Action: Do and experience.
Task: Define/identify value chains by filling out the value chain links on the identification board of one or more biomasses.
Outcomes: Identification of value chain links or possible gaps in the value chain path (if existing).

Workshop Facilitators (Module 2)

Based on the learnings from Module 1, the moderator introduces, facilitates, and moderates Module 2 to guide and support participants/groups to identify the value chains by explaining the identification board and describing the task based on the text provided in the sections above.

Module 3 Allocating impact points

In module 3, the value chains that participants explored in the previous module serve as the foundation for identifying and analysing various impact points related to the blue bioeconomy. The facilitator guides the outcomes and discussion of this session by posing thought-provoking questions provided in the section, question selection module 3. By the end of module 3, they encourage participants to share their insights and experiences.

The first goal is to locate one or more economic, ecological, social, and regulatory points. Participants have two options, they either indicate a challenge (-) or a success point (+) within the value chains at a specific value chain link. The identification board allows participants to locate the identified impact points in a placeholder field (circle with impact point) next to each value chain element box referring to the term or chain link title in the coloured cell. Participants use the value chain element box on the identification board in the second step to describe the impact point. The figure below shows an example of how the four impact topics and the vertical (dashed) and horizontal (solid) time dimensions can be applied.

This figure shows a final identification board after module 3 activities.

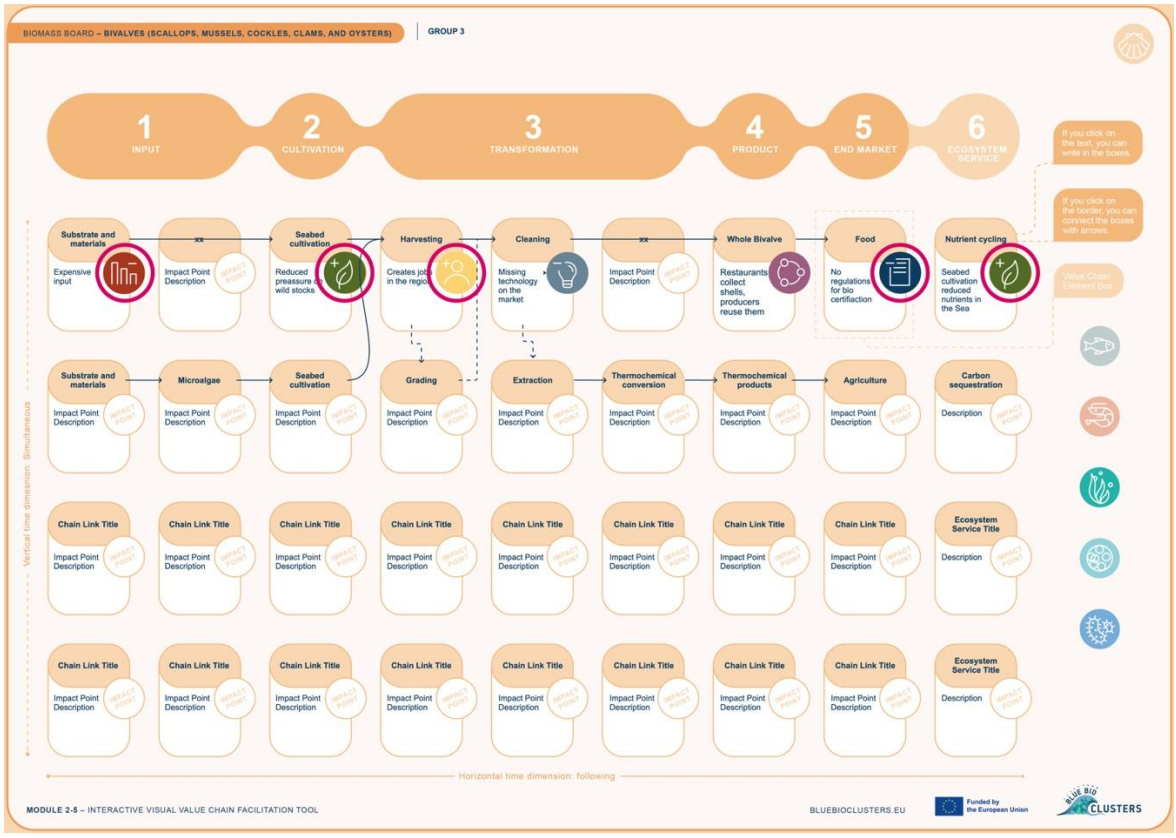

Figure 9 Example Identification Board Economic, Ecologic, Social and Regulatory Points

The following sections provide examples of discussion topics and outcomes.

Economic Impact Points: Participants examine the value chains to identify economic impact points, including production costs, market demand, price fluctuations, and consumer acceptance. They assess which and how economic factors influence the viability and profitability of the value chain and discuss potential strategies to enhance feasibility and economic sustainability.

Ecological Impact Points: The participants identify ecological impact points by analysing the value chains' interactions with ecosystems. This can include issues such as overfishing, habitat destruction, pollution, and climate change effects. The discussions centre on understanding the environmental challenges faced by the blue bioeconomy and exploring ways to adopt more sustainable practices that safeguard marine ecosystems.

Social Impact Points: Social impact points refer to the effects of the blue bioeconomy on individuals, communities, and society's human well-being at large. Participants discuss issues related to employment and livelihoods, working conditions, community well-being, cultural preservation, and social equity. They explore how the value chains can contribute positively to local communities and address any negative social consequences.

Regulatory Impact Points: Regulatory impact points involve analysing the influence of laws, policies, and governance structures on the blue bioeconomy. Participants examine the effectiveness of existing regulations, identify gaps or inconsistencies, and explore how regulatory frameworks can be improved to promote sustainability and responsible practices.

During the discussions in Module 3, participants consider the interdependence of these impact points with the identified value chain. It could also lead to discussing potential interactions of these impact points. For instance, economic decisions may have ecological consequences, and social issues can influence regulatory policies.

The exchange in Module 3 can serve as a basis for formulating strategies and action plans in subsequent workshops. These strategies may address the identified impact points, promote responsible practices, and foster stakeholder collaboration to build a more sustainable and resilient blue bioeconomy.

Action (Module 3)

Duration: In total 1 hour | Introduction: 10 minutes | Module 3 task: 30 minutes | Results & discussion: 20 minutes

Goal: Identifying economic, social, ecological, and regulatory points within the value chain positively or negatively impacting the value chain element at a specific point in the path.

Task: The moderator conducts a survey with participants to identify one or more preferred impact categories (economic, social, ecological, and regulatory). A predefined selection of impact categories done by the moderator is also possible (only economic or economic and social, etc.). Each impact factor is linked to specific questions the moderator asks to steer the discussion and the outcomes. Example questions per impact category are listed in this section and in the annexe of this document (ANNEXE 6.3).

Participants will work on the following:

Option 1 based on module 2: Participants will be grouped as in module 2 and use the filled-out identification boards to identify impact points.

Option 2 based on module 2: The moderator conducts a poll with participants to choose one or more value chains where they identify and describe impact points.

Online Workshop: The first step of the task is to choose the impact icons from one category located on the element board and move them to the specific value chain element. The icon with a minus indicates a challenge, and the element with a plus indicates a success point. After identifying these points, participants use the framed section of the value chain element box on the identification board to describe them.

In-person Workshop: The printed identification boards will be used. The first step of the task is to indicate the impact points of one or more topics. Participants either use the printed sticker sheet or the alternative marker sticker. The name of the topic or abbreviation can be written on the marker sticker (social: S, ecologic: ECO, economic: E, Regulatory: R). The plus [+] indicates a success point, and the minus [-] a challenge. After identifying these points, participants use the value chain element box field of the identification board, a flip chart paper or the back side of the printed sheet to describe the impact points further.

Moderator explanation text: In the third module, you will identify impact points in your predefined value chain based on different categories: social, economic, ecological, and regulatory. You will have 30 minutes to identify and describe the points in the value chain. I will ask you some questions about which factors could be relevant to consider in this activity.

Material and Resources (Module 3)
In-person workshop: Flip chart, marker, and four printed identification boards per biomass in a min. A3 format, printed biomass board in A3/A4 per group/digital biomass board on the beamer, printed question selection.

Online Workshop: Master Miro board, link to the Miro board, question selection.

Workshop Participants (Module 3)

Action: Do and analyse.
Task: Define/identify economic, social, ecological, and regulatory points in the VC.
Outcomes: Identifying specific factors impacting the value chain positively or negatively in the particular region.

Workshop Facilitators (Module 3)

Introduces, facilitates, and moderates the exercise by going back to identified value chains on the identification boards from module 2 and asking relevant questions from the question selection to steer the outcomes and a discussion.

Question Selection (Module 3)

General question:

1. What are the value chain's economic, social, ecological, and regulatory challenges?
2. What are the economic, social, ecological, and regulatory success points?
3. What are the gaps in the value chain, and which contributing factors are causing them?

Questions for identifying specific impact points:

Economic

(-) Challenges:

1. What are the factors that impede the growth of the blue bioeconomy in the region?
    - Limited infrastructure
    - Market access and demand
    - Access to finance
    - Resource depletion and overexploitation
    - Political stability and governance
    - Regulatory constraints
    - Technology and innovation
    - Climate change and environmental risks
    - Skill and knowledge gaps

2. Which of these factors is within your organisation's sphere of influence (direct or indirect influence)
3. Which factors could be influenced by actors within the region?

(+) Success points:

1. Were you always successful, or did a challenge become a success point?
2. What economic performance factors can you achieve in the region (ex., jobs, wages, revenues, productivity, attractivity)
3. Would your success points be transferable or useful to share with other actors?

Social

(-) Challenges:

1. Are required skills and human resources available in the region?
2. What skills and human resources are missing?
3. Are the missing skills and human resources available in the region?
4. Are the jobs attractive? How can they become more attractive?
5. Do you have access to relevant information?
6. Are education and training available?

(+) Success points:

1. Do you stimulate the local employment sector in the region? How?
2. How do you create value for the local community?
3. Which specific factors are beneficial to the local community and the region?

Additional points to be considered:

- Employment and Livelihoods
- Land and Resource Rights
- Social Equity and Inclusivity
- Community Participation and Consultation
- Human Rights and Labour Conditions

- Cultural Heritage and Traditional Knowledge
- Health and Safety
- Social Awareness and Education
- Social Resilience and Adaptation

Ecological/Environmental

(-) Challenges:

1. Which ecological challenges did you identify?
2. Can you identify turning factors to overcome those ecological challenges?

(+) Success points:

1. Where have you identified ecological benefits?
2. Where do you identify potential for ecological benefits?
3. Which factors are needed to be able to achieve ecological benefits?

Regulatory

(-) Challenges:

1. Do you see gaps in the existing regulations?
2. Which regulations are difficult/should be changed to enable the value chain's uptake?
3. How can local policymakers support you in tackling your challenges?

(+) Success points:

1. Which regulations foster the value chain's development?
2. Is the implementation of the regulations helping to meet the requirements (collaborations between policymakers and implementation)

Module 4 Allocating technology points

In Module 4 the focus shifts from economic, ecological, social, and regulatory factors to a more specific one. Participants identify technologies currently utilised in the value chain and assess whether there are available or missing technologies that could enhance the efficiency, sustainability, and overall performance of the blue bioeconomy value chain.

This approach is very similar to module 3 where the value chains that participants explored in module 2 serve as the foundation for identifying technology factors. The facilitator guides the outcomes and discussion of the session by posing thought-provoking questions provided in the section question selection module 4. By the end of Module 4, they encourage participants to share their insights and experiences.

The first goal is to locate the technology points at the value chain links where technology is available or missing (missing technology is indicated with a minus [-] and available technology with a plus [+]). The identification board allows participants to locate the identified impact points to a placeholder field (impact point) next to each value chain element box referring to the term or chain link title in the coloured cell. In the second step, participants use the value chain element box on the identification board to describe the technology using the field impact point description.

This figure shows a final identification board after module 4 activities.

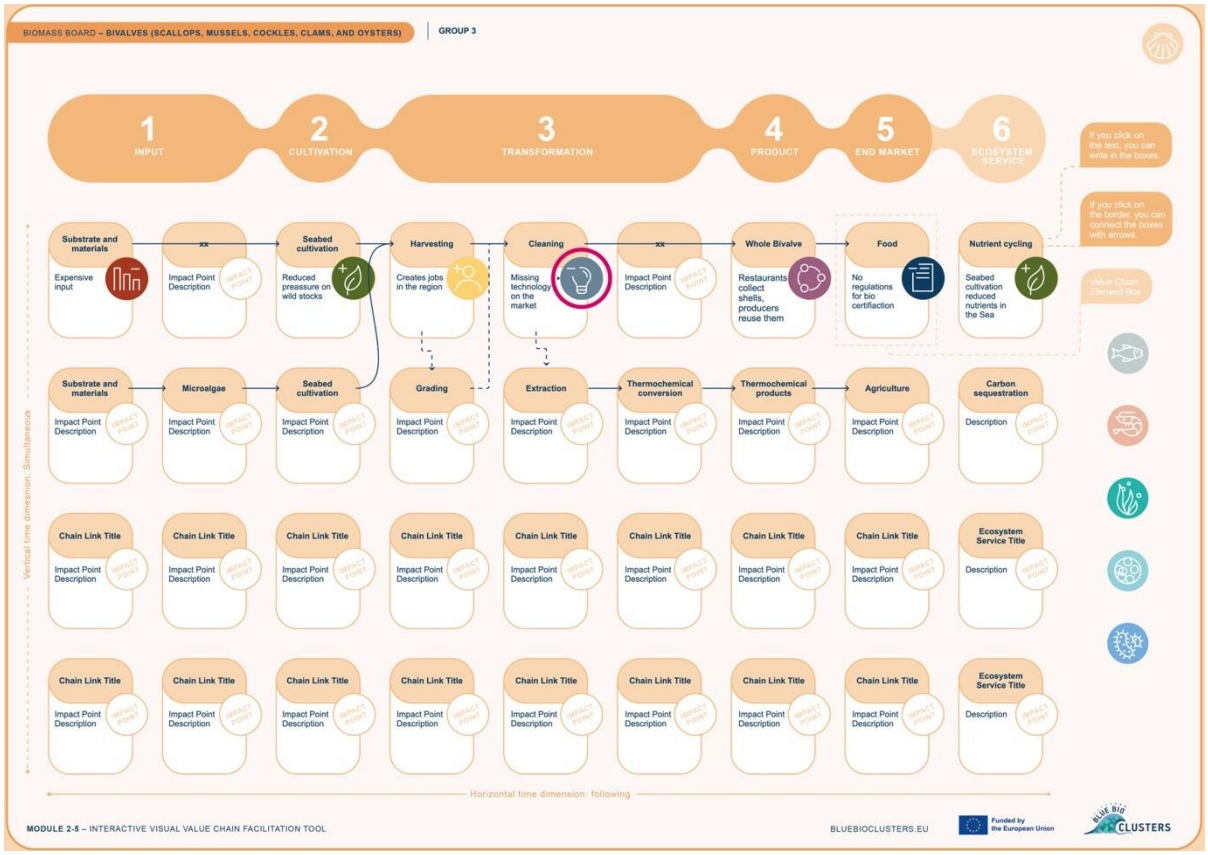

Figure 10 Example Identification Board with Technology Points

The following sections provide examples of discussion topics and outcomes.

Technology Assessment: The module begins with a comprehensive assessment of the technologies employed at each value chain stage. Participants examine the existing technologies used in fishing, aquaculture, processing, and others. This assessment helps to understand the current state of technology adoption and its impact on the value chain.

Identifying Missing Technologies: After identifying missing technologies that address the challenges and limitations in the value chain. These missing technologies could be innovative solutions available in other regions or best practices from other industries.

Sustainable and Responsible Technologies: Discussions in this module also emphasize the importance of adopting sustainable and responsible technologies. Participants consider whether the identified technologies align with principles of environmental sustainability, social responsibility, and ethical considerations. This helps ensure that technological advancements do not lead to unintended negative consequences.

Technological Adoption Barriers: Participants explore the barriers and challenges that may impede the widespread adoption of new technologies in the blue bioeconomy. These barriers may include financial constraints, limited access to technology, lack of awareness or knowledge, and resistance to change. Understanding these obstacles is essential to develop strategies for overcoming them.

Collaboration and Innovation: Module 4 encourages participants to brainstorm ideas for fostering collaboration between technology developers, researchers, industry players, and policymakers. Collaborative efforts can accelerate technology adoption and innovation in the blue bioeconomy, leading to more sustainable and efficient practices.

Scalability and Accessibility: Participants assess whether the identified technologies are scalable and accessible to different stakeholders in the value chain. Scalable technologies can be applied across various production scales, from small-scale artisanal operations to larger industrial processes. Ensuring accessibility is vital to promote inclusivity and equal opportunities for all stakeholders.

The discussions and findings in Module 4 provide valuable insights for developing a technology roadmap for the blue bioeconomy. This roadmap outlines strategic steps for integrating new technologies, addressing the identified missing technologies, and promoting a culture of innovation and continuous improvement. The module's outcomes also inform policymakers, investors, and industry leaders on potential areas for investment and research to enhance the sustainability and competitiveness of the blue bioeconomy value chain.

Action (Module 4)

Duration: In total 50 minutes | Introduction: 10 minutes | Module 4 task: 20 minutes | Results & discussion: 20 minutes

Goal: Identify available technology or technology gaps in the value chain.

Task: In module 4, participants will use the identification board with results from module 2 to identify and describe available technologies or gaps within their value chains.

The technology points are tied to questions the moderator asks to steer the outcomes by starting a discussion. By engaging in discussions around these questions, participants can, for example, gain a comprehensive understanding and insights about the role of technology in this specific blue value chain.

Example questions are listed in the section below and in the annexe of this document. (ANNEXE 6.4)

Participants will work on the following:

Option 1 based on module 2: Participants will be grouped as in module 2 and use the filled-out identification boards to identify existing and successfully used technologies or technology gaps.

Option 2 based on module 2: The moderator conducts a poll with participants to choose one or more value chains where they identify gaps or technologies within these value chains.

Online Workshop: The first step of the task is to choose the technology icons from the element board and locate them on the placeholder where relevant. The icon with a minus indicates a gap, and the element with a plus indicates the availability of technology. After identifying where a gap or technology is available, participants describe the technology or the status quo in the value chain element box on the identification board.

In-person Workshop: The first step is to indicate available technologies or existing gaps in the value chain by using the provided stickers. Participants use one colour and write the T abbreviation directly on the stickers. The indication with a capital [T+] stands for available technology and a [T-] for a gap. To describe the technology or the status quo, they write directly on the identification board in the field below the value chain link (coloured framed part).

Moderator explanation text: In module 4, you will identify points in the value chain where a specific technology is available or missing. You will have 20 minutes to identify and describe the points in the value chain. I will ask you some questions to support you in the identification process. After you have identified and described the technology, one person from each group will present the results.

Material and Resources (Module 4)

In-person workshop: Flip chart, marker,4 printed identification boards per biomass in format, printed biomass board in A3/A4 per group, or digitally displayed on a beamer.

Online Workshop: Master Miro Board, Workshop Miro Board link

Workshop Participants (Module 4)

Action: Do and experience.
Task: Define/identify technology points in the value chain
Outcomes: Identification of specific technologies gaps or available technology.

Results can be used for matching technology seekers and providers within the group/region or beyond.

Workshop Facilitator (Module 4)

Introduces, facilitates, and moderates the exercise by going back to identified value chains on the identification boards from module 2 and asking relevant questions from the question selection of module 4 to steer the outcomes and a discussion.

Question Selection (Module 4)

1. Are the required technologies available in your region?

2. Is the development of new innovative technology required? What are some of the key technologies currently utilised in the value chain of the blue bioeconomy? How do these technologies contribute to the efficiency and productivity of different stages in the value chain?

3. Are there any technological advancements or innovations that could potentially improve the sustainability and environmental performance of the blue bioeconomy value chain? What are the benefits of adopting these technologies?

4. How can technology be used to address specific challenges stakeholders face in the blue bioeconomy, such as overfishing, habitat degradation, or supply chain inefficiencies?

5. What are the barriers or challenges to the widespread adoption of new technologies in the blue bioeconomy? How can these barriers be overcome to promote technology transfer and diffusion?

6. Are there any technologies from other industries that could be adapted or applied to improve processes and practices in the blue bioeconomy value chain? How can cross-sector collaboration be fostered to facilitate technology transfer?

7. How can small-scale or artisanal producers in the blue bioeconomy benefit from technological advancements? What strategies can be employed to make technology accessible and affordable to all stakeholders?

8. How do technologies in the blue bioeconomy value chain interact with social and regulatory aspects? How can technology adoption be aligned with social responsibility and ethical considerations?

9. How can technology improve resource efficiency and reduce waste in the blue bioeconomy? Are there any examples of technologies that have successfully achieved these outcomes?

10. What role can start-ups and entrepreneurs play in developing and implementing innovative technologies for the blue bioeconomy value chain? How can the industry support and incentivize these initiatives?

Module 5 Allocating circularity points

In the last module, the focus is on identifying circularity points within blue value chains. Circularity points refer to opportunities where circular economy principles can be applied to minimize waste, optimize resource use, and promote sustainability.

This module follows a similar approach as the former ones, but it begins with the facilitator's instruction about the circular economy, providing an overview of the circular economy concept and its relevance to the blue bioeconomy[4]. As a next step, participants identify circularity points. The facilitator guides the outcomes and discussion of the session by posing thought-provoking questions provided in the question selection module 5. By the end of Module 5, they encourage participants to share their insights and experiences.

Figure 11 on the next page shows a final identification board after module 5 activities.

[4] Circular economy principles aim to design out waste and keep materials and resources in use for as long as possible.

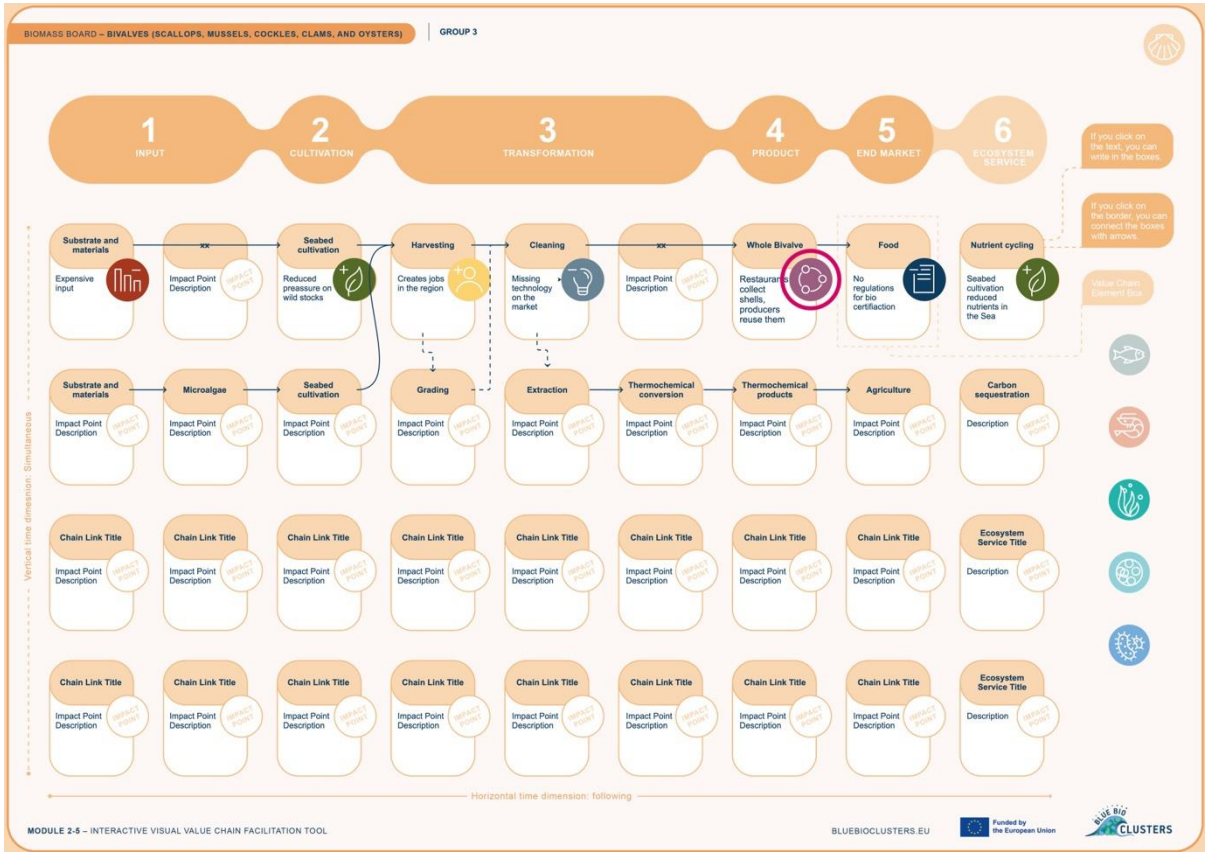

Figure 11 Example Identification Board with Circularity Points

The following sections provide examples of discussion topics and outcomes.

Circular Opportunities: Participants revisit the value chain they have previously explored in the activity and map it out again. With these value chains, participants are guided to identify circularity points at each stage. These points may involve recycling, reusing, refurbishing, remanufacturing, or adopting renewable resources. The aim is to identify ways to close the loop, reducing waste and resource consumption.

Stakeholder Engagement: Participants discuss the importance of engaging stakeholders throughout the value chain to foster circularity. Collaboration and communication among actors are crucial for implementing circular economy practices effectively.

Life Cycle Thinking: The module emphasizes the importance of adopting a life cycle thinking approach when identifying circularity points. Participants consider the environmental impacts and resource use associated with each stage of the value chain, from raw material extraction to end-of-life product disposal.

Circular Business Models: Discussions explore innovative business models that support circularity in the blue bioeconomy. These models can include product-as-a-service, leasing, or sharing platforms, which encourage resource optimization and reduce waste generation.

Challenges and Opportunities: Participants discuss the challenges and opportunities of implementing circularity in the value chain. Challenges may include shifting from linear to circular models, addressing consumer behaviour, and overcoming regulatory barriers. Opportunities may include cost savings, enhanced environmental performance, and improved stakeholder relationships.

Circular Economy Policy and Support: The module also addresses the role of policy frameworks and government support in fostering circularity in the blue bioeconomy. Participants discuss potential policy incentives, funding programs, and regulatory measures that can encourage circular practices.

The outcomes of Module 5 provide participants with a comprehensive understanding of how circular economy principles can be integrated into the blue bioeconomy value chain. They gain insights into the potential environmental, social, and economic benefits of circularity and develop the first steps of a roadmap for incorporating circular practices. Identifying circularity points is a valuable tool for promoting sustainable practices, reducing waste, and creating a more resource-efficient blue bioeconomy.

Action (Module 5)

Duration: In total: 40 minutes | Introduction: 10 minutes | Module 5 task: 20 minutes | Results & discussion: 10 minutes

Goal: Identify components in the value chain stage that have the potential to be included in a circular value chain concept.

Task: In module 5, participants will use the identification board from module 2 to identify and describe circularity points

The circularity points are tied to questions asked by the moderator to steer the outcomes by starting a discussion. By engaging in discussions around these questions, participants' awareness about the circular economy will be activated, creating a surrounding to exchange best practices.

Example questions are listed in the section below and in the annexe of this document. (ANNEXE 6.5)

Participants will work on the following:

Option 1 based on module 2: Participants will be grouped as in module 2 and use the filled-out identification boards to identify and describe circularity points.

Option 2 based on module 2: The moderator conducts a poll with participants to choose one or more value chains where they identify and describe circularity points.

Online Workshop: The first step of the task is to choose the circularity icons from the element board and locate them on the placeholder where relevant. After identifying where a gap or technology is available, participants describe the technology or the status quo in the value chain element box on the identification board.

In-person Workshop: The first step is to indicate possible circularity points using the provided stickers. Participants use one colour and write the C-abbreviation directly on the stickers. To describe the circularity points or their status quo, they write directly on the identification board in the field below the value chain link (coloured framed part).

Material and Resources (Module 5)

In-person workshop: Flip chart, marker, 4 printed identification boards per biomass in format, printed biomass board in A3/A4 per group, or digitally displayed on a beamer.

Online Workshop: Master Miro Board, Workshop Miro Board link

Moderator explanation text

In module 5, you will identify circularity points in the value chain. A circularity point marks the potential of a value chain link in the value chain to be integrated into the circular economy concept. This could be waste, energy or anything else that could be reused in the same or another process of a described or utterly new value chain. You will have 20 minutes to identify and describe these points in the value chain. After you have identified and described the technology, one person from each group will present the results.

Workshop Participants (Module 5)

Action: Do and experience.
Task: Define/identify circularity points
Outcomes: Identification of potential circularity points indicating, for example, biomass that could be used within the same value chain or integrated into a new process of a different value chain.

Workshop Facilitator (Module 5)

Introduces, facilitates, and moderates the exercise by going back to identified value chains on the identification boards from module 2 and asking relevant questions from the question selection of module 5 to steer the outcomes and a discussion.

Question Selection (Module 5)

1. What does circularity mean in the context of the blue bioeconomy, and why is it essential for sustainability and resource efficiency?

2. How can circular economy principles be applied to different stages of the value chain in the blue bioeconomy, such as fishing, aquaculture, processing, and distribution?

3. What are some examples of circularity points in the value chain of specific biomass products? How can we close the loop and minimize waste in these processes?

4. What challenges or barriers might hinder the adoption of circular practices in the blue bioeconomy value chain? How can we overcome these challenges?

5. How can stakeholder collaboration and engagement be promoted to foster circularity in the blue bioeconomy? What role do governments, businesses, NGOs, and local communities play in this process?

6. How does circularity contribute to the overall sustainability and resilience of the blue bioeconomy? What are the potential environmental, economic, and social benefits?

7. Are there any innovative circular business models that can be applied to the blue bioeconomy value chain? How can these models enhance resource efficiency and reduce environmental impact?

8. How can life cycle thinking be integrated into decision-making processes in the blue bioeconomy value chain? How does considering the complete life cycle of products influence circularity strategies?

9. What are the opportunities for integrating circular practices into existing blue bioeconomy operations? How can we identify and prioritize circularity points for implementation?

10. How can consumer awareness and behaviour influence circularity in the blue bioeconomy? What strategies can be employed to promote sustainable consumption and product reuse or recycling?

11. What role can research and innovation play in advancing circularity in the blue bioeconomy value chain? How can new technologies and best practices be leveraged to support circular initiatives?

12. What policy measures or regulatory frameworks can support and incentivize circular practices in the blue bioeconomy? How can policymakers collaborate with industry stakeholders to promote circularity effectively?

5 References

Kaplinsky, R. & Morris, M. 2000. *A Handbook for Value Chain Research.* Ottowa, International Development Research Centre.

FAO. 2018c. *Developing gender-sensitive value chains: Guidelines for practitioners.* Rome. (Available at http://www. fao.org/3/a-i6462e.pdf).

UNIDO. 2009. *Agro Value Chain Analysis and Development: The UNIDO Approach*. Vienna.

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FAO and UNDP. 2020. *Toolkit for value chain analysis and market development integrating climate resilience and gender responsiveness - Integrating agriculture in National Adaptation Plans (NAP-Ag) Programme*. Bangkok. (Available at: https://doi. org/10.4060/cb0699en)

6 Annexes

6.1 Checklists

Online Workshop

Material and Resources	Checkbox
Master Miro board: The board comprises a frame, Board Links for Workshops with boxes. In each box, a field for the workshop name and the region where to workshop took place must be filled out by facilitators. They use the link in the filled-out box for their workshop. Whenever a new workshop occurs, a new box must be filled out, and a new link will be used. (Master Miro Board)	
Links to be shared with participants: one specific Miro board link. (The facilitators must choose one link in the Master Miro board!!)	
Optional: Slido poll or voting corner on the Workshop Miro Board to decide which biomass board most participants want to use during the workshop.	

In-person Workshop

Applied Modules	Module Name	Materials Available	Example Materials for a workshop	Checkbox
MODULE 1&2	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3)	Example: 1x Biomass board 4x Identification boards	
MODULE 1&2+3	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 3 ECONOMIC • ECOLOGIC • SOCIAL • REGULATORY POINTS	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 24x Sticker sheets/amount based on the selection (A4) xx Ordered stickers: circle, 4 colours, 1,5-2 cm diameter	Example: 2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker per colour (80x4 colours) (20 per colour and identification board)	
MODULE 1&2+4	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 4 TECHONOLGY	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 4x Sticker sheet per identification board (A4) xx Ordered stickers: circle, 1 colour, 1,5-2 cm diameter	Example: 2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker (20 per identification board)	
MODULE 1&2+5	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 5 CIRCULARITY	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 4x Sticker sheet per identification board (A4) xx Ordered stickers: circle, 1 colour, 1,5-2 cm diameter	Example: 2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker (20 per identification board)	
MODULE 1-5	1 QUIZ 2 BLUE VALUE CHAIN IDENTIFICATION 3 ECONOMIC • ECOLOGIC • SOCIAL • REGULATORY POINTS 4 TECHONOLGY 5 CIRCULARITY	6x Biomass boards/Selection of biomass boards (A4) 24x Identification boards/amount based on the selection (A3) 4x Sticker sheet per identification board (A4) xx Ordered stickers: circle, 6 colours, 1,5-2 cm diameter	Example: 2x Biomass board 8x Identification boards 8x Sticker sheet 80x Sticker per colour (80x6 colours) (20 per colour and identification board)	

6.2 Question Selection Module 1 | Quiz

1. Who are the key stakeholders involved in the value chain of the specific biomass product we examined?
2. How do their roles differ at each stage of the value chain?
3. How does the diversity of stakeholders in the blue bioeconomy impact decision-making, resource management, and sustainability efforts?
4. What are the potential challenges in coordinating actions among different actors?
5. What are some examples of interdependence between various stakeholders in the value chain?
6. How does one stakeholder's actions or decisions affect others along the chain?
7. In what ways can collaboration between stakeholders enhance the sustainability and social responsibility of the blue bioeconomy?
8. How can we promote cooperation and knowledge-sharing among different actors?
9. What challenges do small-scale or artisanal producers face in participating in the blue bioeconomy?
10. How can we ensure their inclusion and support in sustainable practices?

6.3 Question Selection Modul 3 | SOCIAL | ECONOMIC | ECOLOGIC | REGULATORY

A General question

1. What are the value chain's economic, social, ecological, and regulatory challenges?
2. What are the economic, social, ecological, and regulatory success points?
3. What are the gaps in the value chain, and which contributing factors are causing them?

B Questions for identifying specific impact points

ECONOMIC

(-) Challenges:

1. What are the factors that impede the growth of the blue bioeconomy in the region?
    - Market access and demand
    - Access to finance
    - Resource depletion and overexploitation
    - Political stability and governance
    - Regulatory constraints
    - Technology and innovation
    - Climate change and environmental risks
    - Skill and knowledge gaps
2. Which of these factors are within your organisation's sphere of influence (direct or indirect influence)?
3. Which factors could be influenced by actors within the region?

(+) Success points:

1. Were you always successful, or did a challenge become a success point?
2. What economic performance factors can you achieve in the region (ex., jobs, wages, revenues, productivity, attractivity)
3. Would your success points be transferable or useful to share with other actors?

SOCIAL

(-) Challenges:

1. Are required skills and human resources available in the region?
2. What skills and human resources are missing?
3. Are the missing skills and human resources available in the region?
4. Are the jobs attractive? How can they become more attractive?
5. Do you have access to relevant information?
6. Are education and training available?

(+) Success points:

1. Do you stimulate the local employment sector in the region? How?
2. How do you create value for the local community?
3. Which specific factors are beneficial to the local community and the region?

Additional points to be considered:

- Employment and Livelihoods
- Land and Resource Rights
- Social Equity and Inclusivity
- Community Participation and Consultation
- Human Rights and Labour Conditions
- Cultural Heritage and Traditional Knowledge
- Health and Safety
- Social Awareness and Education
- Social Resilience and Adaptation

ECOLOGICAL/ENVIRONMENTAL

(-) Challenges:

1. Which ecological challenges did you identify?
2. Can you identify turning factors to overcome those ecological challenges?

(+) Success points:

1. Where have you identified ecological benefits?
2. Where do you identify potential for ecological benefits?
3. Which factors are needed to be able to achieve ecological benefits?

REGULATORY

(-) Challenges:

1. Do you see gaps in the existing regulations?
2. Which regulations are difficult/should be changed to enable the value chain's uptake?
3. How can local policymakers support you in tackling your challenges?

(+) Success points:

1. Which regulations foster the value chain's development?
2. Is the implementation of the regulations helping to meet the requirements (collaboration between policymakers and implementation)

6.4 Question Selection Module 4 | TECHNOLOGY

1. Are the required technologies available in your region?

2. Is the development of new innovative technology required? What are some of the key technologies currently utilised in the value chain of the blue bioeconomy? How do these technologies contribute to the efficiency and productivity of different stages in the value chain?

3. Are there any technological advancements or innovations that could potentially improve the sustainability and environmental performance of the blue bioeconomy value chain? What are the benefits of adopting these technologies?

4. How can technology be used to address specific challenges stakeholders face in the blue bioeconomy, such as overfishing, habitat degradation, or supply chain inefficiencies?

5. What are the barriers or challenges to the widespread adoption of new technologies in the blue bioeconomy? How can these barriers be overcome to promote technology transfer and diffusion?

6. Are there any technologies from other industries that could be adapted or applied to improve processes and practices in the blue bioeconomy value chain? How can cross-sector collaboration be fostered to facilitate technology transfer?

7. How can small-scale or artisanal producers in the blue bioeconomy benefit from technological advancements? What strategies can be employed to make technology accessible and affordable to all stakeholders?

8. How do technologies in the blue bioeconomy value chain interact with social and regulatory aspects? How can technology adoption be aligned with social responsibility and ethical considerations?

9. How can technology improve resource efficiency and reduce waste in the blue bioeconomy? Are there any examples of technologies that have successfully achieved these outcomes?

10. What role can start-ups and entrepreneurs play in developing and implementing innovative technologies for the blue bioeconomy value chain? How can the industry support and incentivize these initiatives?

6.5 Question Selection Module 5 | CIRCULARITY

1. What does circularity mean in the context of the blue bioeconomy, and why is it essential for sustainability and resource efficiency?

2. How can circular economy principles be applied to different stages of the value chain in the blue bioeconomy, such as fishing, aquaculture, processing, and distribution?

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11. What role can research and innovation play in advancing circularity in the blue bioeconomy value chain? How can new technologies and best practices be leveraged to support circular initiatives?

12. What policy measures or regulatory frameworks can support and incentivize circular practices in the blue bioeconomy? How can policymakers collaborate with stakeholders to promote circularity effectively?

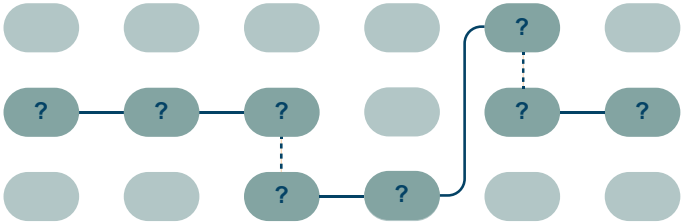
6.6 Printable Boards

MODULE 1 – QUIZ

It uses the highlighted value chain path on the **BIOMASS BOARDS**, representing a value chain from origin to end. A guessing activity encourages estimating the types of actors involved and enhances the understanding of the visualisation of the path required for subsequent modules.

MODULE 2 – BLUE VALUE CHAIN IDENTIFICATION

It uses two board types, the **BIOMASS BOARDS** for inspiration and the **IDENTIFICATION BOARDS** serving as a workspace to note down chain link titles and connect the identified chain links / **VALUE CHAIN ELEMENT BOX** with dashed (simultaneous process) or solid lines (sequential process) resulting in the value chain path.



MODULE 3 – ECONOMIC • ECOLOGIC • SOCIAL • REGULATORY POINTS

It uses complemented **IDENTIFICATION BOARDS** from module 2. Impact points (⊕→success, ⊖→challenge) will be identified by choosing icons (**ELEMENT BOARD** / sticker) and allocated at the placeholder circle. The impact point description will be noted in the framed field of the **VALUE CHAIN ELEMENT BOX**.

ECONOMIC POINT | **SOCIAL POINT** | **ECOLOGICAL POINT** | **REGULATION POINT**

MODULE 4 – TECHNOLOGY

It uses complemented **IDENTIFICATION BOARDS** from module 2. Technology points (⊕→available technology, ⊖→technology gap) will be identified by choosing icons (**ELEMENT BOARD** / sticker) and allocated at the placeholder circle. The technology point description will be noted in the framed field of the **VALUE CHAIN ELEMENT BOX**.

TECHNOLOGY POINT

MODULE 5 – CIRCULARITY

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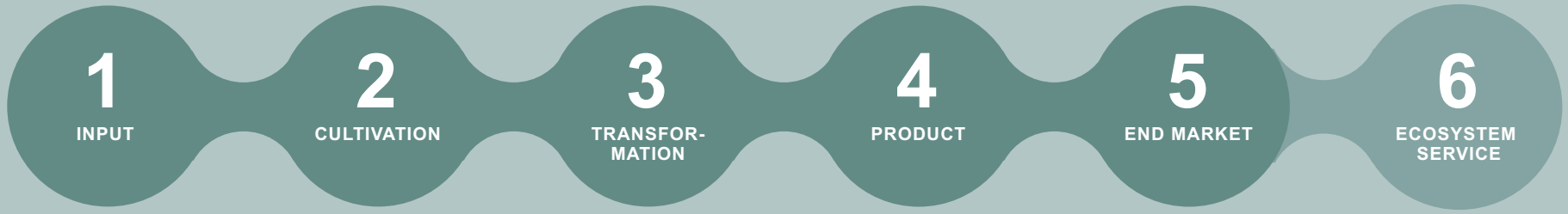
CIRCULARITY POINT



Smolt
Oxygen
Materials
Labor
Feed
Microalgae
Vegetable proteins
Fish meal/oil
Wild
Cultivated
Tanks/ Ponds
Cages/Net pens
Harvesting
Cooling/ Freezing
Cleaning
Gutting
Cutting/Peeling/ Trimming/ chopping
Processing
Shelf-stable
Chilled/ Frozen processed
Extraction
Ensiling
Whole fish
Head
Frames (bones, fins)
Viscera
Meat
Polysaccharides
Proteins
Fatty acid (Omega3)
Collagen
Gelatin
Silage
Research and development
Food
Feed
Nutrients
Cosmetics
Pharmaceuticals
Agriculture
Clothes
Accessories
Nutrient cycling
Ecosystem resilience
Biodiversity enhancement
Food
Feed
Genetic resources
Ornamental resources
Biochemical cycles
Tourism & recreational activities
Aesthetic benefits

Involved Actors

- Fishers and fishing companies
- Processing plants (if not available on vessel)
- Fish comany/brand
- Fupermarkets

Funded by the European Union

1	2	3	4	5	6
INPUT	CULTIVATION	TRANSFORMATION	PRODUCT	END MARKET	ECOSYSTEM SERVICE

Vertical time dimesnion: Simultaneous

Value Chain Element Box

Horizontal time dimension: sequential

1 INPUT

2 CULTIVATION

3 TRANSFORMATION

4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimesnion: Simultaneous

Horizontal time dimension: sequential

1	2	3	4	5	6
INPUT	CULTIVATION	TRANSFORMATION	PRODUCT	END MARKET	ECOSYSTEM SERVICE

Vertical time dimesnion: Simultaneous

IMPACT POINT

Value Chain Element Box

Horizontal time dimension: sequential

1	2	3	4	5	6
INPUT	CULTIVATION	TRANSFORMATION	PRODUCT	END MARKET	ECOSYSTEM SERVICE

Vertical time dimesnion: Simultaneous

IMPACT POINT

Value Chain Element Box

Horizontal time dimension: sequential

MODULE 1 – QUIZ

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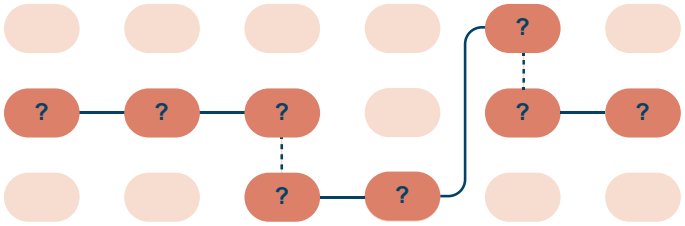

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ECONOMIC POINT | **SOCIAL POINT** | **ECOLOGICAL POINT** | **REGULATION POINT**

MODULE 4 – TECHNOLOGY

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TECHNOLOGY POINT

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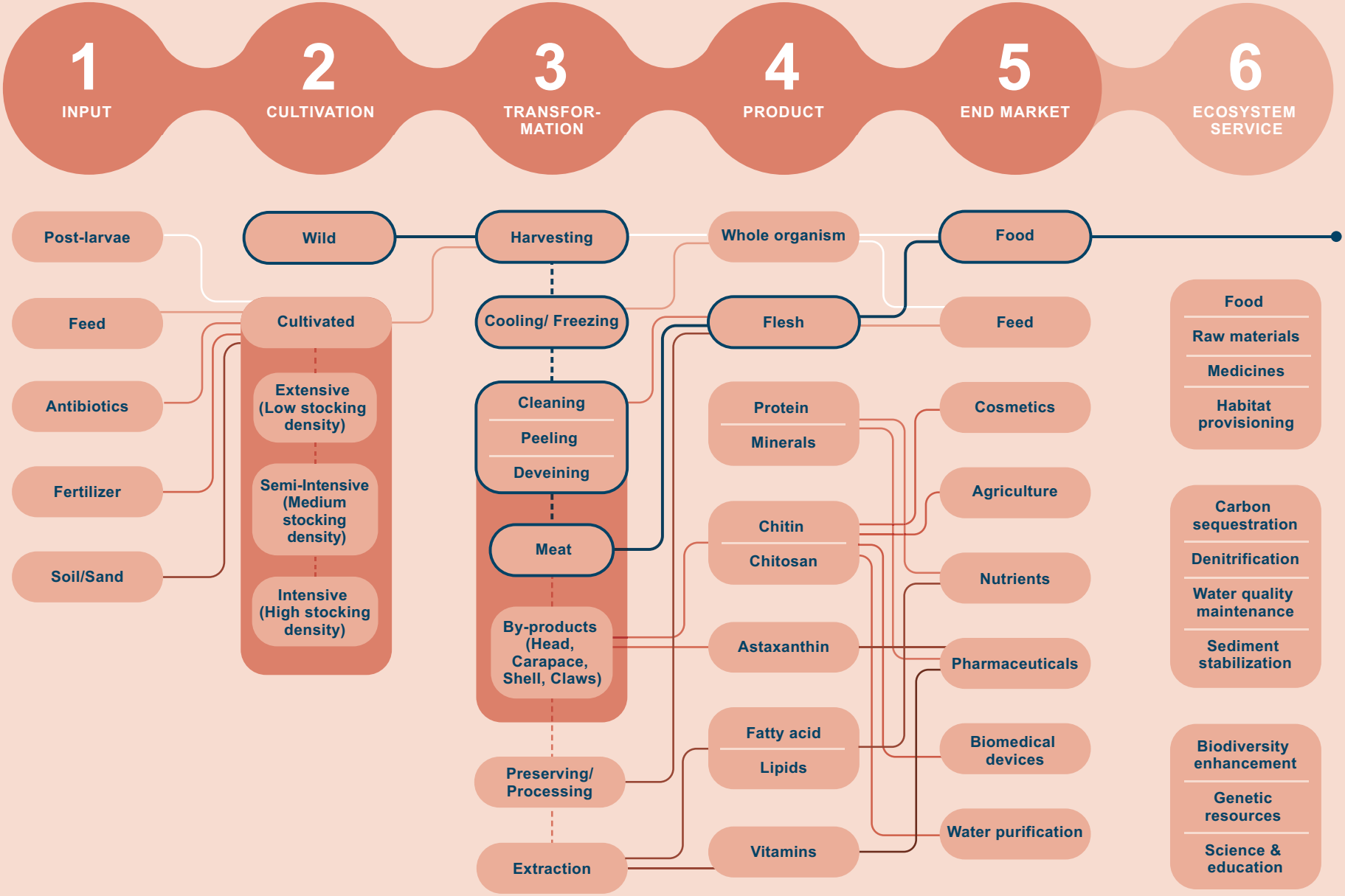
CIRCULARITY POINT



Involved Actors

- Boat crew
- Low-skilled labour (sorting, manual peeling, or is this automated, MP: both exist depending on the processing plant scale)
- Food processing plant employees (ready to eat dishes)
- High-skilled labour (lab technicians, quality supervisors)
- Refrigerated transport/ logistics
- Restaurants, B2B distributors, supermarkets

Funded by the European Union

1 INPUT

2 CULTIVATION

3 TRANSFORMATION

4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

Vertical time dimesnion: Simultaneous

IMPACT POINT

Value Chain Element Box

Horizontal time dimension: sequential

1 INPUT

2 CULTIVATION

3 TRANSFORMATION

4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

Vertical time dimesnion: Simultaneous

IMPACT POINT

Value Chain Element Box

Horizontal time dimension: sequential

1 INPUT

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4 PRODUCT

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6 ECOSYSTEM SERVICE

Vertical time dimesnion: Simultaneous

IMPACT POINT

Value Chain Element Box

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4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

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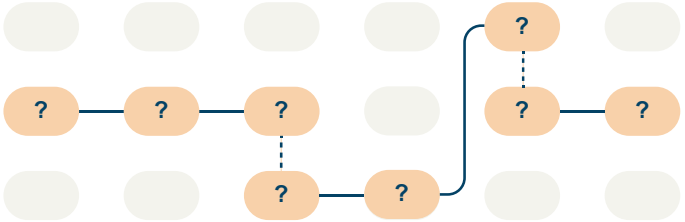

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ECONOMIC POINT | **SOCIAL POINT** | **ECOLOGICAL POINT** | **REGULATION POINT**

MODULE 4 – TECHNOLOGY

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TECHNOLOGY POINT

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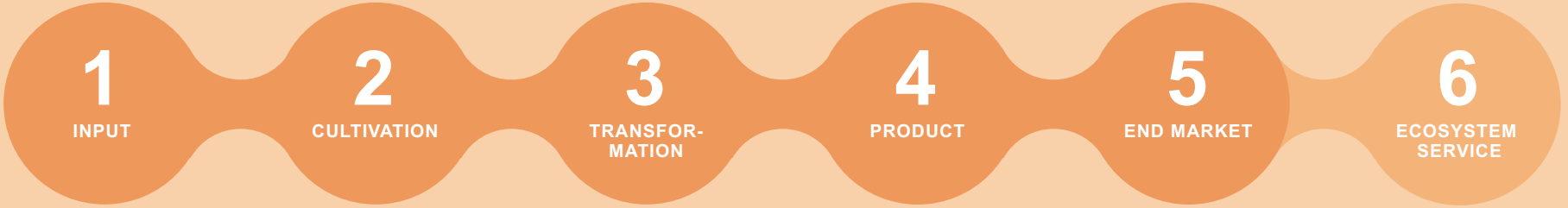

Seeding
Oxygen
Microalgea
Substrate and materials
Wild
Cultivated
Seabed cultivation
Suspended cultivation
Hatcheries
Harvesting
De-clumping and grading
Cleaning/ Shucking
Cooling/ Freezing
Cooking and Vacuum packing
Extraction
Thermochemical conversion
Whole bivalve
Meat
Shell
Rewilding
Polysaccharides Lipids Proteins
Thermochemical products
Food
Feed
Nutrients
Pharmaceuticals
Agriculture
Construction
Water treatment
Jewelry Ornaments
Rewilding

Nutrient cycling
Habitat provisioning
Biodiversity enhancement

Food
Feed
Fertilizers
Construction materials

Biochemical cycles
Carbon sequestration
Prevents shoreline erosion

Involved Actors

- Mussel farmers and companies
- Depuration plants staff
- Lab technicians (analysis of mussel samples)
- Cooperatives
- Refrigerated transport/ logistics
- Restaurants, catering companies and supermarkets

Funded by the European Union

1 INPUT
2 CULTIVATION
3 TRANSFORMATION
4 PRODUCT
5 END MARKET
6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimesnion: Simultaneous

Horizontal time dimension: sequential

1 INPUT
2 CULTIVATION
3 TRANSFORMATION
4 PRODUCT
5 END MARKET
6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimesnion: Simultaneous

Horizontal time dimension: sequential

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2 CULTIVATION
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5 END MARKET
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IMPACT POINT

Value Chain Element Box

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Horizontal time dimension: sequential

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3 TRANSFORMATION

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5 END MARKET

6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimesnion: Simultaneous

Horizontal time dimension: sequential

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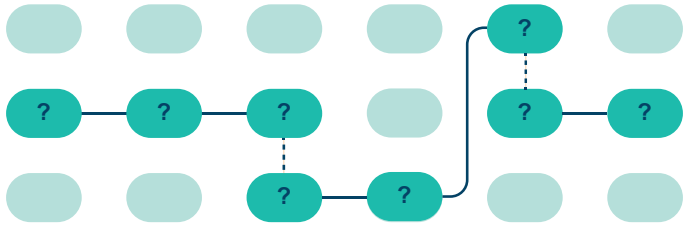

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ECONOMIC POINT

SOCIAL POINT

ECOLOGICAL POINT

REGULATION POINT

MODULE 4 – TECHNOLOGY

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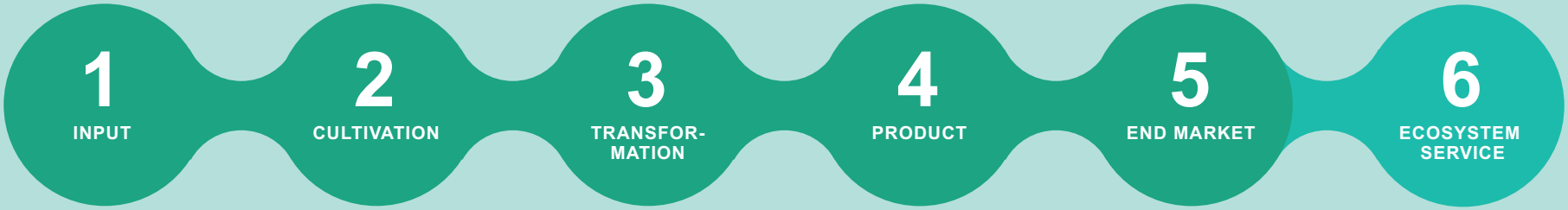
TECHNOLOGY POINT

MODULE 5 – CIRCULARITY

It uses complemented **IDENTIFICATION BOARDS** from module 2. Circularity points will be identified by choosing icons (**ELEMENT BOARD** / sticker) and allocated at the placeholder circle. The circularity point description will be noted in the framed field of the **VALUE CHAIN ELEMENT BOX**.

CIRCULARITY POINT



Seeding
Materials
Artificial fertilizers
CO_2
Waster water
Labour
Standing Rocks
Natural blooms
Sea cultivation
On-land tanks
Macroalgae
Extraction
Anaerobic digestion
Fermentation
Hydrothermal conversion
Carbohydrates
Proteins
Lipids
Pigments
Phenolics
Enzymes
Biomethane
Bioethanol Biobuthanol
Succinic acid Lactic acid etc
Bio-oil
Biojet fuel
Biochar
Thermochemical products
Cosmetics
Nutrition
Pharmaceuticals
Speciality chemicals
Bio-packing
Food
Feed
Biofuel
Bioenergy
Bulk Bio-based chemicals
Bioremeditation
Research & Developement
Food web
Nutrient cycling
Water current & sediment management
Raw materials
Chemical resources
Energy supply
Eutrophication regulation
Science & education
Genetic resources

Involved Actors

- Seaweed bio-banks
- Seaweed nursery
- Seaweed farm labourers
- Biorefineries / processor / businesses
- Supermarkets / shops / restaurants

Funded by the European Union

1	2	3	4	5	6
INPUT	CULTIVATION	TRANSFORMATION	PRODUCT	END MARKET	ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimesnion: Simultaneous

Horizontal time dimension: sequential

1	2	3	4	5	6
INPUT	CULTIVATION	TRANSFORMATION	PRODUCT	END MARKET	ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimesnion: Simultaneous

Horizontal time dimension: sequential

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IMPACT POINT

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Vertical time dimesnion: Simultaneous

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1	2	3	4	5	6
INPUT	CULTIVATION	TRANSFORMATION	PRODUCT	END MARKET	ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimesnion: Simultaneous

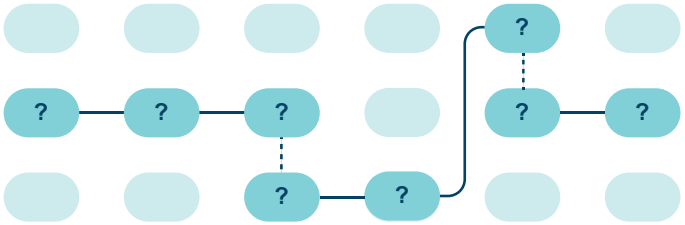
Horizontal time dimension: sequential

MODULE 1 – QUIZ

It uses the highlighted value chain path on the **BIOMASS BOARDS**, representing a value chain from origin to end. A guessing activity encourages estimating the types of actors involved and enhances the understanding of the visualisation of the path required for subsequent modules.

MODULE 2 – BLUE VALUE CHAIN IDENTIFICATION

It uses two board types, the **BIOMASS BOARDS** for inspiration and the **IDENTIFICATION BOARDS** serving as a workspace to note down chain link titles and connect the identified chain links / **VALUE CHAIN ELEMENT BOX** with dashed (simultaneous process) or solid lines (sequential process) resulting in the value chain path.



MODULE 3 – ECONOMIC • ECOLOGIC • SOCIAL • REGULATORY POINTS

It uses complemented **IDENTIFICATION BOARDS** from module 2. Impact points (⊕→success, ⊖→challenge) will be identified by choosing icons (**ELEMENT BOARD** / sticker) and allocated at the placeholder circle. The impact point description will be noted in the framed field of the **VALUE CHAIN ELEMENT BOX**.

ECONOMIC POINT | **SOCIAL POINT** | **ECOLOGICAL POINT** | **REGULATION POINT**

MODULE 4 – TECHNOLOGY

It uses complemented **IDENTIFICATION BOARDS** from module 2. Technology points (⊕→available technology, ⊖→technology gap) will be identified by choosing icons (**ELEMENT BOARD** / sticker) and allocated at the placeholder circle. The technology point description will be noted in the framed field of the **VALUE CHAIN ELEMENT BOX**.

TECHNOLOGY POINT

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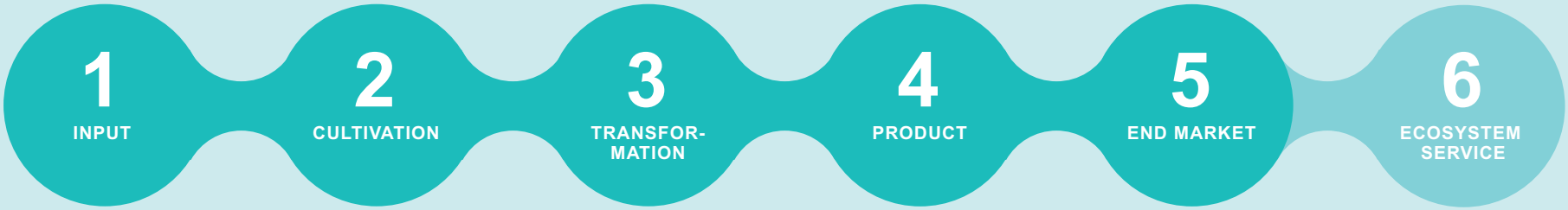
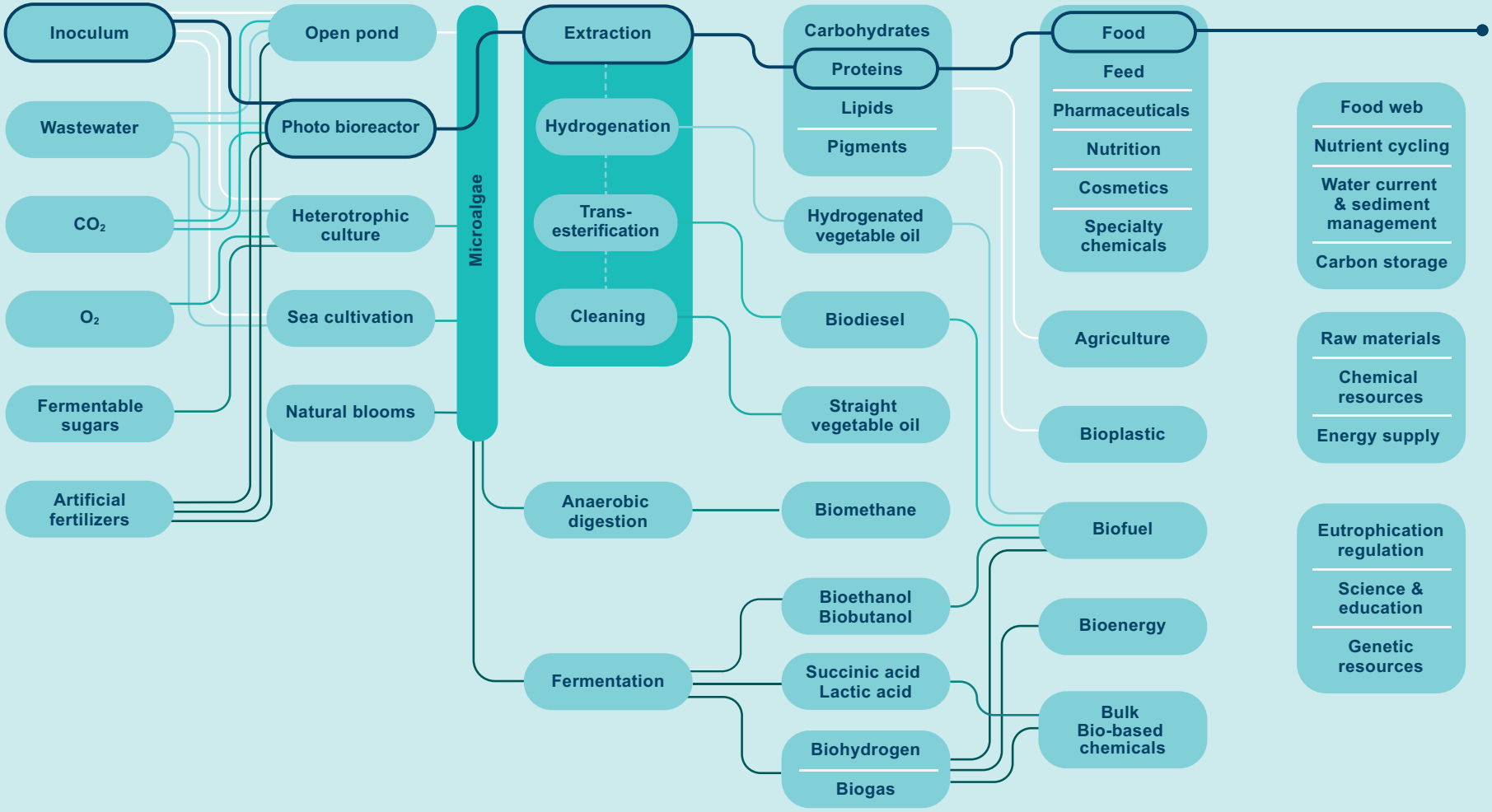
CIRCULARITY POINT





Involved Actors

- Microalgae producers/ Algatech
- International corporation backing
- High-skilled labour, bakeries/ baking companies

Funded by the European Union

1 INPUT

2 CULTIVATION

3 TRANSFORMATION

4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimension: Simultaneous

Horizontal time dimension: sequential

1 INPUT

2 CULTIVATION

3 TRANSFORMATION

4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimension: Simultaneous

Horizontal time dimension: sequential

1 INPUT

2 CULTIVATION

3 TRANSFORMATION

4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

IMPACT POINT

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IMPACT POINT

Value Chain Element Box

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Horizontal time dimension: sequential

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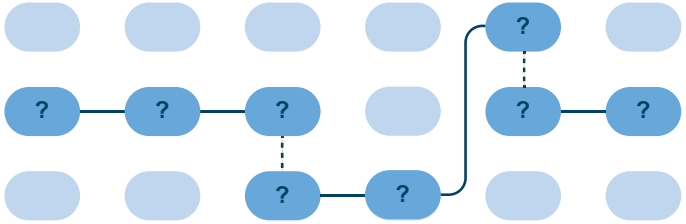

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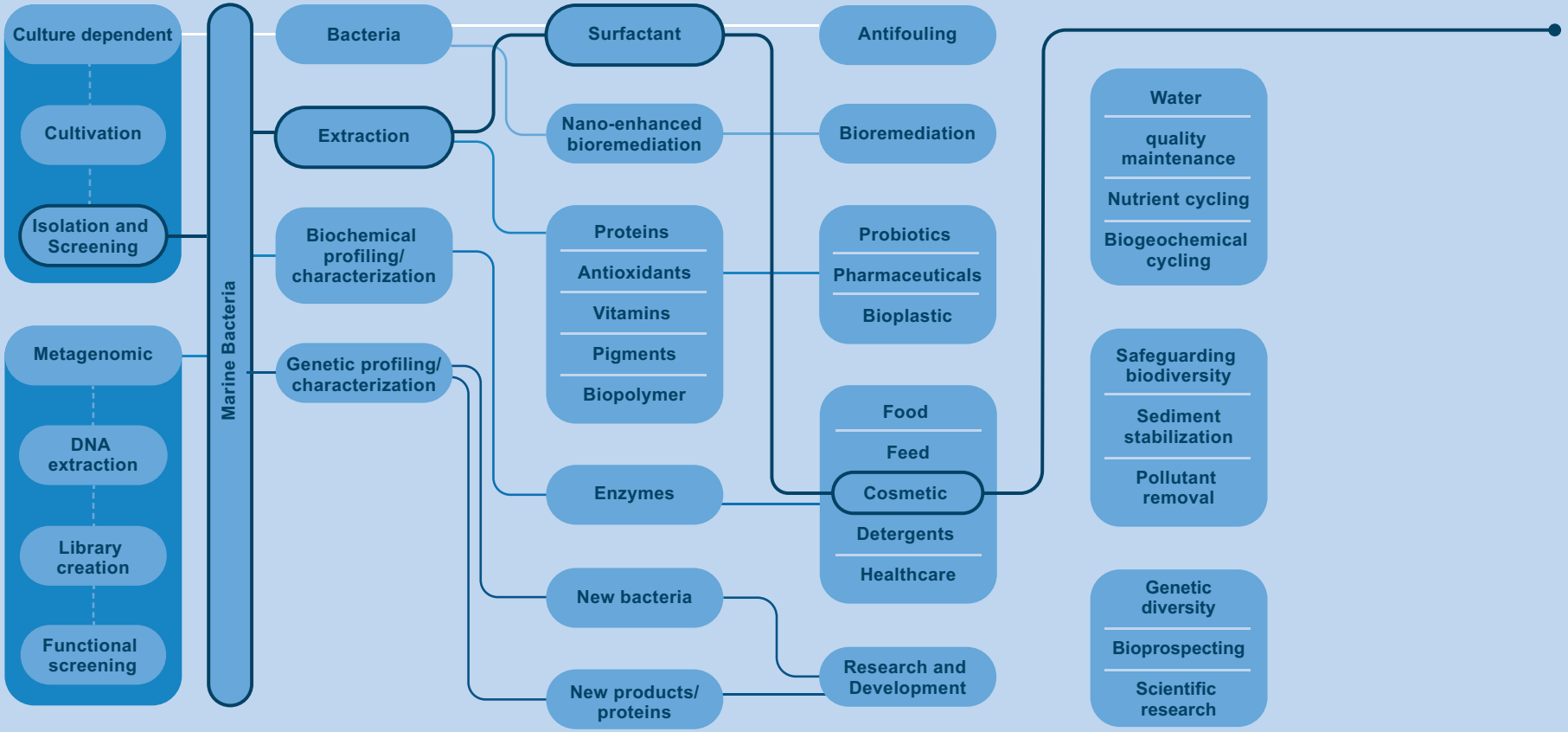

Funded by the European Union

1 INPUT

2 CULTIVATION

3 TRANSFORMATION

4 PRODUCT

5 END MARKET

6 ECOSYSTEM SERVICE

IMPACT POINT

Value Chain Element Box

Vertical time dimension: Simultaneous

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IMPACT POINT

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IMPACT POINT

Value Chain Element Box

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IMPACT POINT

Value Chain Element Box

Vertical time dimension: Simultaneous

Horizontal time dimension: sequential

6.7 Sticker Sheet for Printing Company (in-person workshops)

STICKER SET

MODULE 1-3

MODULE 4

MODULE 5