



# Mechanisms in action: How circular initiatives deepen, broaden, and spread

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## ABSTRACT

The shift from a linear economy to a circular bioeconomy comes with many challenges in culture, behavior, business, technology and institutions, requiring transformative change. Circular initiatives are considered starting points for such a transformation as they demonstrate tangible alternatives to a linear, fossil-based economy. However, detailed insights into the progress of circular impact made by these initiatives have been lacking. Furthermore, conceptualizations of their development have primarily focused on upscaling, neglecting the diverse and dynamic development trajectories these initiatives might take in practice. The research aim of this paper was to better understand how circular initiatives contribute to transformative change. This study empirically explored three different development trajectories of circular initiatives; deepening (become more radical and circular), broadening (connecting with other domains and agendas) and spreading (becoming larger and more numerous). Based on interviews and desk research, 31 circular initiatives in the Netherlands were studied— in the domains of agriculture, biobased materials, marine research, and nature. The results revealed eight configurations, which are combinations of mechanisms that together guided initiatives' development: deepening of initiatives was triggered by 1) focus and 2) reorganization; broadening was driven by 3) unusual collaboration, 4) aligning interests and 5) establishing a focus; and spreading occurred through 6) increasing capacity, 7) credibility and 8) offering perspective. These eight configurations provided in-depth insights into the diverse and dynamic development of circular initiatives. The configurations highlighted the significance of the interplay of mechanisms in studying the development of initiatives and in designing strategies to guide current and future circular initiatives.

## 1. Introduction

Earth's ecosystems are endangered by the current linear economy, characterized as *extract-produce-use-dump* (Haberl et al., 2011; Poore and Nemecek, 2018). To alter this course, consumption and production patterns must be rewired to safeguard the regenerative capacity of the earth while limiting losses and use of finite resources, a so-called circular bioeconomy (CBE) (Muscat et al., 2021). The redesign of our current linear economy towards a CBE raises technical, business, behavioral, and institutional challenges and therefore calls for transformative change (Farla et al., 2012; Mak et al., 2019; Tura et al., 2019).

The urgency of transforming to a CBE is reflected in the growth of circular initiatives. Initiated by social, private, or public actors, these initiatives provide alternatives for persistent environmental issues by demonstrating in-depth concrete results on a moderate scale (Termeer and Metze, 2019; Loorbach et al., 2020). They are referred to as seeds, small signs, bright spots, starting points, or small wins for transformative

change (O'Brien, 2020; Wittmayer et al., 2019; Bennett et al., 2016; Termeer and Metze, 2019).

To maximize the transformative potential of circular initiatives, understanding their contribution to system-wide transformation is crucial. Three development trajectories are distinguished in the literature through which these initiatives can increase their impact: deepening, broadening, and spreading (Moore et al., 2015; Termeer and Metze, 2019; van den Bosch and Rotmans, 2008; Salo et al., 2022). Deepening entails initiatives becoming more radical and circular, such as the continuous improvement of the Fairphone (Biedenkopf et al., 2019). 'More radical' entails moving from first order changes (optimizing) to second (reforming through adopting new practices and establishing relationships) or third order changes (redesign by addressing underlying values, goals, and identities), through which the level of circularity increases (Silvius et al., 2023). Through broadening initiatives connect with other domains and agendas such as expanding the ban on free plastic bags to other single-use plastics (Termeer and

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Metze, 2019). Spreading refers to becoming larger and more numerous, such as the multiplying of community farming initiatives (Schagen et al., 2023).

Within these development trajectories, various underlying mechanisms interact. Existing literature has identified numerous mechanisms for accelerating transformative initiatives (Bours et al., 2022; Ehnert et al., 2018; Gorissen et al., 2018; Lam et al., 2020; Termeer and Metze, 2019). Examples of individually studied mechanisms are: experimentation and learning processes (Van Poeck et al., 2020) and professionalization (van der Schoor and Scholtens, 2015).

Two research gaps are identified in this growing body of literature, which require more empirical grounding. First of all, various scholars suggest that the interaction between individual mechanisms may lead to a positive, self-reinforcing dynamic that drives transformative change (Ehnert et al., 2018; Gorissen et al., 2018; Termeer and Metze, 2019). However, while the literature does acknowledge the mutual reinforcement by mechanisms, the focus has so far been on identifying the presence or absence of individual mechanisms (Bours et al., 2022; Lam et al., 2020; Loorbach et al., 2020; Strasser et al., 2020). Consequently, insights on how multiple different mechanisms work *together* to steer the deepening, broadening, and spreading of initiatives is lacking. These combinations of mechanisms are from now on referred to as *configurations*.

Second, these interrelating mechanisms are not yet related to outcomes. As Ehnert et al. (2018) point out: '*relationships between the mechanisms are manifold and complex*'. Unravelling this complexity requires a clear distinction between transformative processes (mechanisms) and how they relate to the development trajectories (deepening, broadening, and spreading). Schagen et al. (2023) developed a framework containing eight mechanisms in relation to deepening, broadening, and spreading. However, this conceptualization needs more empirical grounding and understanding of how initiatives develop to move beyond case-specific insights (Köhler et al., 2019), isolated experimentation (Sengers et al., 2021), and single-sector perspectives (Hebinck et al., 2021).

Therefore, this paper focused on the question: *which configurations of mechanisms contribute to deepening, broadening, and spreading of circular initiatives?* To explore the relationship between mechanisms and development, 31 circular initiatives were analyzed within the domains of agriculture, nature, marine, and biobased products in the Dutch context. Understanding the different roles of these mechanisms in distinct development trajectories is a key step towards designing effective strategies to further amplify the impact of circular initiatives.

## 2. The development of circular initiatives

Initiatives are considered important starting points and drivers for change because they exemplify and diffuse alternative ways of thinking, doing and organizing, and as such, function as narratives of change (Gorissen et al., 2018; Wittmayer et al., 2019). The various concepts existing in the literature to refer to these initiatives highlight the interdisciplinary interest in their role. Frequently used conceptualizations include social innovations (Moore et al., 2015), niches (Smith and Raven, 2012), bright spots (Bennett et al., 2016), urban living labs (von Wirth et al., 2019), experiments (Sengers et al., 2021), transition or sustainability initiatives (Lam et al., 2020; Gorissen et al., 2018). This study adopts the conceptualization of 'circular initiatives' as emerging alternative ways of 'thinking, doing and organizing,' with the aim of promoting circular and biobased practices (Silvius et al., 2023).

The pursuit of understanding initiatives's role within larger transformations has given rise to a wide variety of different theories of change and conceptualizations. In addition to the diversity of concepts used to refer to the 'what' of initiatives, there exists also a variety in conceptualizations of 'how' these initiatives can contribute to larger transformations. One predominant framework for analyzing transformations is the multi-level perspective (MLP) model, which distinguishes three

interacting levels: niches, regime and landscape (Geels, 2011). Another influential framework has been the multi-phase model, in which initiatives' development is understood as 'multi-phased', characterized by the emergence, take-off, acceleration and stabilization of initiatives (Rotmans et al., 2001).

These two characteristics of multi-level and multi-phase provide a lens for zooming out and visualizing what the CBE-transformation could look like; niches (circular initiatives) emerge, develop, and accelerate to compete with the regime (the linear economy). This, combined with landscape pressures (e.g., increasing awareness of environmental degradation), leads to the destabilization of the existing regime until a new regime-equilibrium is found (the circular bioeconomy). Based on these multi-level and multi-phased characteristics, much literature has focused on how these emerging initiatives *accelerate* to increase their impact and the involved mechanisms driving this acceleration (Markard et al., 2020; Köhler et al., 2019).

From this growing body of literature, two key insights have emerged, guiding, and inspiring this research. Firstly, the traditional linear perspective, which understands acceleration merely as upscaling, falls short in conceptualizing the dynamic development of initiatives in practice (O'Brien, 2020; Köhler et al., 2019). Recent conceptualizations and empirical insights have nuanced the importance of upscaling by demonstrating different dimensions and mechanisms of acceleration (Ehnert et al., 2018; Nicol, 2020). These conceptualizations emphasize the importance of linking different initiatives, contexts, and agendas, as represented by concepts such as 'accumulation' (Naber et al., 2017), 'cross-cutting' (Moore et al., 2015) and 'broadening' (van den Bosch and Rotmans, 2008). Moreover, the impact on the institutional environment, by changing laws and policy, is considered key. Various conceptualizations refer to this process, such as 'scaling up' (Moore et al., 2015; Rotmans and Loorbach, 2008; Lam et al., 2020), embedding (Gorissen et al., 2018), institutionalization (Fuenfschilling et al., 2019), or 'transformation' (Naber et al., 2017). However, the overlap and variety of concepts creates conceptual unclarity on what is the driving process and what is the impact created. For example, embedding the initiative within its institutional context can be considered an outcome but it also is a way for the initiative to have more impact. This interplay illustrates the complexity in change processes as mechanisms mutually influence each other.

The second insight underscores that initiatives themselves need to adapt to sustain acceleration of transformative change. This is evident in the emphasis on experimenting, reflexivity, and learning (Sengers et al., 2021) and within the Strategic Niche Management's approach, in which the shielding, nurturing, and empowering of initiatives before market exposure is highlighted (Smith and Raven, 2012). To further challenge and replace the existing regime, niches must 'reconfigure' (Bui et al., 2016). Furthermore, initiatives need to be 'translated' to institutionalize their approach and practices, (Raven et al., 2011). Lastly, initiatives are metaphorically described as seeds of change, emphasizing their need to further grow (Bennett et al., 2016).

The above-described insights were the main drivers of this study to apply the small wins perspective when studying how initiatives develop. This perspective complements existing literature by distinguishing itself from the multi-level (niche, regime, landscape) and multi-phase (emergence, take-off, acceleration, and stabilization) approach (Patterson et al., 2017; Linnér and Wibeck, 2021). Whereas the multi-level and multi-phase models provide a broad overview, the small wins perspective enables a more detailed exploration of the direct dynamics of initiatives' development. In contrast to understanding initiatives' development as a multiple-phased process, the small wins perspective emphasizes continuous change. Initiatives contribute to transformative change by continuously, step by step, developing their practices and approach, based on new insights (Termeer and Dewulf, 2019; Weick and Quinn, 1999; Salo et al., 2022). Furthermore, when analysing initiatives' development, distinguishing the distinct levels empirically is challenging, as in practice initiatives are started by niche and regime

actors (El Bilali, 2019). The small wins perspective acknowledges the importance of initiatives initiated at all levels of society (Termeer and Metze, 2019). For instance, alternative circular ways of thinking, doing, and organizing can emerge through new business models, networks, legislation, and foundations. This diversity is necessary for a successful transformation, especially since the exact outcomes of transformations remain uncertain, and variety increases the chances of progress within the transformation (Leeuwis et al., 2021).

Furthermore, unlike SNM, the small wins perspective does not focus on protected niches. Instead, it allows to study initiatives exposed, and in interaction with their direct environment, as such they can create momentum for larger scale changes (Patterson et al., 2017; Salo et al., 2022; Bours et al., 2022). The small wins perspective emphasizes tangible, concrete results on a moderate scale, which can be identified. By identifying these tangible steps, it becomes feasible to study initiatives' development more in-depth, and explore the various mechanisms involved.

To recognize the variety of development trajectories of initiatives and make a clear conceptual distinction between an initiative's development and its contributing mechanisms, the framework by Schagen et al. (2023) is applied. These development trajectories - deepening, broadening, and spreading - enable initiatives to continually challenge the linear economy. By setting up concrete plans and realizing these through concrete results initiatives develop themselves step by step. The explanatory processes that contribute to these trajectories are identified

**Table 1**

Definitions of the development trajectories of deepening, broadening, and spreading (based on Schagen et al., 2023) categorized in 'medium', 'strong' and 'not observed'.

Trajectory	Strength (medium as concrete plans, strong as concrete actions and results)	Definition
Deepening	Medium	<i>to become more radical and circular</i>
	Strong	
	Not observed	
Broadening	Medium	<i>to integrate with other sectors, ambitions, and agendas</i>
	Strong	
	Not observed	
Spreading	Medium	<i>to become more numerous and expand</i>
	Strong	
	Not observed	

**Table 2**

Definitions of the eight mechanisms (based on Schagen et al., 2023) categorized in 'medium', 'strong' and 'not observed'.

Mechanisms	Strength	Definitions
Learning by doing	Medium	<i>Room for experimentation, reflection and maintaining flexibility. Insights in opportunities, barriers and feedback reactions can alter the beliefs and strategies of an initiative.</i>
	Strong	
	Not observed	
Partnering	Medium	<i>The sharing of resources, competences, and capacities between different relevant actors within networks and collaborations. These partners define shared norms and interests within long-term cooperation that preferably result in contracts and agreements.</i>
	Strong	
	Not observed	
Stabilizing	Medium	<i>The advantages of the practices and narrative of an initiative and the disadvantages of the practices of the status quo are internalizing in the minds. This is materialized in the routines of actors like members, partners, and institutions; making them resilient to resistance and ensuring continuity.</i>
	Strong	
	Not observed	
Embedding	Medium	<i>Adoption and integration of its design, approach, or outcomes into ambitions, agendas and/or communities of practice. And concretized in changes in planning, budgets, institutions, and regulations.</i>
	Strong	
	Not observed	
Logic of attraction	Medium	<i>Through a positive reputation of the initiative, as a solution/direction, more financial and human resources are attracted. The positive results discourage the usual opponents and lower resistance and barriers.</i>
	Strong	
	Not observed	
Professionalization	Medium	<i>Recognition as a serious player (instead of temporary experiment) and/or development of a structured organization. This is materialized in e.g., the ability to acquire funding and/or being invited to official meetings.</i>
	Strong	
	Not observed	
Energizing	Medium	<i>Concrete outcomes and visible results provide actors with the excitement that these are attainable. Thereby encouraging them to look ahead for the next step. A reassuring process of commitment, optimism, and trust in the actors involved and the results.</i>
	Strong	
	Not observed	
Replicating	Medium	<i>Others start copying a specific practice. Others start copying the approach and multiple practices.</i>
	Strong	
	Not observed	

as mechanisms, capable of generating positive feedback effects through which change can accumulate (Lam et al., 2020; Schagen et al., 2023; Termeer and Metze, 2019; Salo et al., 2022). As outlined in Table 1., each trajectory is subdivided into three levels: initiatives with concrete plans (medium), those with concrete actions and results (strong), and those where these aspects could not be identified (not observed).

Schagen et al. (2023) categorized eight mechanisms based on various conceptualizations found in the literature (von Wirth et al., 2019; Gorissen et al., 2018; Lam et al., 2020; Loorbach et al., 2020; Termeer and Metze, 2019, see Table 2). These mechanisms explain how initiatives develop, e.g., through experimentation, reflection, and learning (learning by doing) and by forming partnerships in which resources and knowledge are shared (partnering) (Gorissen et al., 2018; Termeer and Metze, 2019). The mechanism of energizing refers to the continuous commitment and trust the involved actors have in their initiative and ambitions. According to the small wins perspective, continuous concrete results generate the energy necessary for initiatives to persist in reaching their ambitions, and only by their persistence can these initiatives sustain transformative change (Schagen et al., 2023). By identifying these eight mechanisms in relation to deepening, broadening, and spreading, it became possible to unravel the configurations: the relevant combinations of mechanisms which steer the development of initiatives.

### 3. Method

A qualitative approach was applied to study the configurations for deepening, broadening, and spreading. This study adopted the approach as developed by Ragin (2014), who states that cases can be understood as configurations, as a combination of characteristics. The configurations were understood as the combinations of mechanisms in relation to deepening, broadening, and spreading. Exploring these configurations across cases provided insights in how initiatives developed. As Byrne (2005) describes it: *'We can deal with lots of cases and see how the configurations they represent can help us to understand the various ways in which things have come to be as they are, the various ways in which they might be different, and - with luck and the wind in the right quarter - how social action might produce one possible future rather than another'* (p.101). The qualitative analysis consisted of three steps. The first two steps contained the selection of the 31 circular initiatives and collection of data on those cases. The third step, the data analysis, consisted of three parts: 1)

identifying the presence of deepening, broadening, and spreading and the mechanisms within the cases; 2) identifying which mechanisms occur most within deepening, broadening, and spreading initiatives; 3) tracing which combinations of mechanisms were most important for the initiatives which deepened, broadened and spread.

### 3.1. Case selection

An *information oriented selection* was applied, meaning that cases were selected based on the expectations about the insights they could provide on how initiatives develop their circularity (Flyvbjerg, 2006). The project team consisted of researchers from eight research groups within Wageningen University & Research (Economic-, Bio-based product-, Marine-, Environmental-, Plant, Livestock, Animal Production Systems and Public Administration and Policy). Each researcher selected cases within their domain of expertise, resulting in a total of 78 circular initiatives in the Netherlands. The cases were categorized based on their level of adherence to the small wins criteria. These criteria included: having achieved concrete results; positive contribution to the CBE-ambition; presenting in-depth changes (defined as second order and third order changes, further developed in the context of circularity by Silvius et al., 2023); having overcome barriers and resistance; and connecting technical and societal change (Termeer and Metze, 2019). This resulted in a selection of 31 initiatives (Table 3). These 31 initiatives include foundations, businesses, research programs, consortiums, covenants, and pilot projects (for a more detailed description of the initiatives see Appendix B). As these initiatives vary in their development and did not meet all the criteria of being a small win, they are referred to as initiatives, instead of small wins.

### 3.2. Data collection

To gain insight into the development of the circular initiatives, 40 semi-structured recorded and documented interviews were held with representatives of these initiatives in the period of November 2019–April 2020. The project team co-designed the interview protocol. The interviews, together with data from desk research on websites, newspapers, and articles, formed the case descriptions. These case descriptions provided an overview of the activities, ambitions, and the development of an initiative and to what extent certain mechanisms were present and relate to their development trajectory. The summaries were validated by the initiatives. The case descriptions were complemented with four workshops in which preliminary findings were discussed and validated.

### 3.3. Data analysis

The first step of the analysis involved identifying the presence or absence of the eight mechanisms and the development trajectories of deepening, broadening, and spreading. The data was coded based on the three categories of development trajectories: deepening, broadening, and spreading (as outlined in Table 1 in section 2), and the mechanisms (as presented in Table 2 in section 2). The three resulting categories were labeled as strong, medium, and not observed. The last three columns of Table 3 provide an overview of the trajectories within the initiatives. In the second step, the mechanisms that occurred most frequently within the different development trajectories were identified (presented in Table 4 of the Results section; for a more thorough explanation of these steps, see Appendix A). The third step involved tracing back the initiatives that were able to deepen, broaden, and/or spread to identify the combinations of mechanisms most explanatory for each development trajectory. These combinations of mechanisms, present within the initiatives that achieved concrete results within the development trajectories, were coded.

## 4. Results: configurations for deepening, broadening, and spreading

Within the cases 14 instances of deepening, 14 of broadening and 11 of spreading were identified. Table 4 shows which mechanisms are most prominent within these development trajectories. Overall, the mechanisms of learning by doing, partnering, professionalization, energizing and logic of attraction are occurring most frequently. However, their individual presence was not enough to understand their influence. For that the configurations, the combinations of mechanisms in relation to deepening, broadening, and spreading, need to be understood. For example, learning by doing, partnering, and energizing are considered important for deepening, but it is unclear how it led to concrete results of deepening.

By studying the trajectories through the lens of mechanisms the combinations of mechanisms which are likely to reinforce each other were explored. Eight foremost configurations were identified which consist of combinations of mechanisms in relation to the development trajectories (i.e., deepening (2), broadening (3), and spreading (3)). In the upcoming section these configurations will be discussed and illustrated with examples. More examples of each configuration can be found in the last column of Table 3.

### 4.1. Deepening through refocusing and re-organizing

Two main configurations for deepening were identified: refocusing and re-organization. The first configuration describes how initiatives can deepen, meaning becoming more circular and radical, when they adjust their focus or ambition (Fig. 1). Accomplishing their first concrete results provides the motivation to continue (energizing). When initiatives are, next to energized, reflecting on their current activities they become better at identifying problems and opportunities (learning by doing). As initiatives have achieved the first results trust is gained within their collaborations (partnering). Through partnering resources, such as knowledge and funding, are shared creating opportunities for advancing the initiative (deepening).

Within the Plastic Soup Foundation this first configuration of refocusing is prominently visible. After some years of successful agenda-setting (energizing) of the general effects of plastic, the initiative refined their focus when learning that single-use plastics are causing most damage and microplastics are a hazard for human health (learning by doing). Through increasing cooperation with partners (partnering) the initiative became more engaged with identifying and evaluating solutions and offering action perspectives on mitigating pollution instead of their initial focus on agenda-setting (deepening).

The second configuration through which initiatives can deepen takes place through re-organization themselves and the way they aspire to achieve their circular ambitions. Initiatives which deepen follow a pattern of being adaptive in their organization through reflecting on their strategies and adjusting them accordingly (learning by doing and professionalization) (Fig. 2). Improving their organizational structure and becoming recognized as a serious alternative for the current norm can assist in institutionalizing their interests and/or practices within their own field or sector (embedding). Through this, initiatives are capable to reach more circular and radical results (deepening) (see Fig. 2). Within Nedvang this configuration is visible in how responsibilities and roles of actors are re-defined. Initially, the organization began with covenants outlining the individual responsibilities of package-producing companies. The following step was setting up a tax system. However, as the costs of implementing a tax system increased, the organization transitioned into an extended producer responsibility system organized within an independent waste fund, Nedvang (professionalization). Here the continuous adjusting by reorganizing based on new insights is visible (learning by doing) and the shift from a voluntary system towards more surveillance and compliance through Nedvang (embedding). By reorganizing, Nedvang is better equipped to achieve



**Table 3**

Overview of the 31 studied circular initiatives and the three development trajectories (deepening, broadening, and spreading).

Name	Deepening (D)	Broadening (B)	Spreading (S)
Plastic Soup Foundation	Raising awareness to focus on solutions/action perspectives.	Focus broadened to plastics as human health hazard, next to environment, and education.	Wider reach, internationalization, increase in volunteers
Ark Oyster reefs (foundation)	Next to multi-use also advocating for the purpose and right of oyster reefs on its own, by aiming for Marine Protected Areas (medium).		Increase to two locations of reefs. Setting up its own breeds to develop oyster reefs spat on shell.
Temporary Nature (foundation)	Letting go of the idea of maintenance of the temporary nature area. Developed from Green Deal project to foundation.		Increase to 3915 ha divided across 61 terrains. Spreading of the concept to Germany.
Future Farmers (foundation)	Applying commons thinking on land (lease contracts). Developed from knowledge exchange to representative organization.	Connecting different topics and issues within agricultural transformation.	Increase in members (from 20 to 300). Merging with other organizations into the Federation of Agroecological farmers.
Green Circles (foundation)	From a focus on electric transport trucks to electric vehicles on water.		
Remeker (dairy farmer)	Developing holistic approach to soil.	Pioneering with collective purchasing of land.	
Hamletz (circular pig husbandry)	Improving the housing system.	Next to animal welfare also incorporating the environmental footprint.	Increase (temporarily) in availability in supermarkets.
Grassa (biorefinery)			Increasing capacity of the installation for grass refinery.
The New Dairy Farmer		Increasing the transparency and awareness about soy production (medium).	Developing the processing installation for the locally produced soy (medium).
Proud of Yerseke (oyster production)		Combination of ecological research and the potential prospects of commercial offset.	The size of the breeds is growing. Norway and USA started experimenting as well.
Kwatrijn-stable (dairy farmer)	Improvements of stable to reduce ammonia and now focusing on methane emissions.	Connecting dairy production with nature conservation.	
Orange-broiler (arable and poultry farmer)	Stronger ties between poultry part and arable farming part of the farm to increase circularity.		
Circlevalue (consortium)	Focus shifted from organizing the waste collection most efficiently to integrating policy and implementation to reach better results. Further organizational and technological innovation.	Connected with social ambitions such as creating social working places and creating local employment.	Through cooperation with other municipalities reaching 25 % of the volume of the Netherlands of packaging plastics for sorting and processing.
Biofoam (business)		More applications of the circular foam.	
Nedvang (waste fund)	From covenant to a tax system and further developed to an extended producer responsibility system through an independent waste fund. Improvements through differentiating between material types and recyclability of the packaging.	Is being used as example for other packaging streams such as cars and mattresses (medium).	Belgium and Germany are also experimenting with a similar system (medium).
Rodenburg Biopolymers (business)	Focus shifted from substituting petroleum with bioplastics towards extending the shelf life of products through packaging (medium).		
Proseaweed (researchproject)	The derived knowledge led to better insights on how to realize offshore seaweed production and research questions for a follow-up project (medium).		
Tomato-fiberbox (consortium)	Focus developed from developing boxes out of tomato fibers to also having an antifungal function, increasing the shelf life of tomatoes (medium).		
Value of Water (consortium)			
Zero discharge strategy (covenant)		Exploring connections with drought- and flood prevention (medium).	30 % of horticulture sector implements the zero-discharge strategy of fertilizers and pesticides.
Cultivation New Style (consortium)	Exploring the integration of different hormone, mineral and ecological knowledge of plants (medium).	The primary focus is on Co2 reduction but has expanded to reducing pesticide use and the fertilizer discharge into the surface water (medium).	Increasing number of producers following the program (around 1000). A widespread movement that adopts this new cultivation technique.
Testlab Tiny House & Forestry (pilot project)			A variety of initiatives across the Netherlands but not fully realized yet (medium).
Impaqt (researchproject)	Shifted focus from the remote management system of an offshore farm towards being an example and driver of realizing mussel production at sea.		
The Mobile Yard (foundation)	From being mobile to focus on specific location and possibilities there (medium).	More products and crops.	No desire to grow further than 50 households.
Agro-testing ground de Peel (community of practice)	Further developing good practices such as composting biomass use for soil improvement and particulate matter reduction.	Variety of projects that e.g., combine nature conservation and farming, and public engagement to reduce particulate matter.	Growing as a network and in access to land (from 5 to 35 ha).
Food forestry	Aspiring to be more self-sufficient as food forestry (medium).	Focus more on eco-literacy and making the university more sustainable (medium).	Financier stimulates growth in projects. Increase in volunteering students.
Droevendaal (pilot project)			
Skylark (foundation)	Focus shifted from developing a business model towards knowledge exchange as main motive amongst members. Together with monitoring.	Educate agricultural advisors about healthy soils for better yields. Knowledge of arable farmers exchanged with chain partners and research.	First increased in members and partners but later this declined. 22 out of 39 regional groups continued within a new similar initiative.

*(continued on next page)*

**Table 3** (continued)

Name	Deepening (D)	Broadening (B)	Spreading (S)
Urban Farmers (roof top farm)		Visitor center with education and tours about the combination of greenhouse and aquaponics.	
New Mixed Farm (agropark)		Cooperating entrepreneurs around a poultry farm, a pig husbandry, and a manure processing installation.	
Greenport Venlo (pilot project)	Next to Floriade exhibition no concrete results.		Transitioned into Brightlands campus since 2019.
Testing ground Natura 2000 (pilot projects)	Further develop ammonia emissions reducing measures and evaluate these on their effectiveness and applicability.		

**Table 4**

Overview of how often mechanisms occur within the development trajectories of deepening, broadening, and spreading.

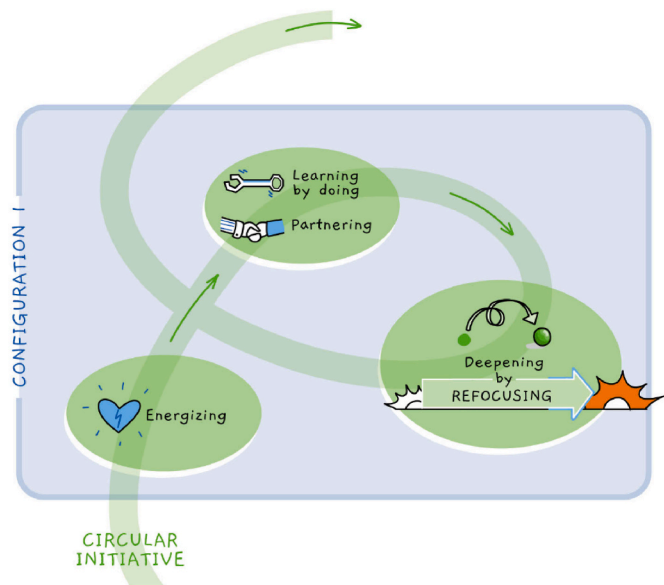
	Deepening (14)	Broadening (13)	Spreading (11)
Learning by doing	12	13	11
Partnering	12	10	9
Embedding	4	3	4
Stabilizing	6	7	5
Professionalization	8	8	8
Logic of attraction	9	10	10
Energizing	13	10	10
Replicating	5	4	5

for attracting partners (Fig. 3). Partnering with other actors increases the opportunities of an initiative to broaden as capacities and knowledge are shared and new opportunities explored (learning by doing). In the development of the Tomato fiber-box, a box made from stems from tomatoes, was only possible because of the unusual cooperation between the horticulture, the waste sector, and the paper- and cardboard industry (partnering). The consortium around this initiative was financially and organizationally supported by the municipality of Westland, the Province of South-Holland, and an interest group of the horticulture. However, the lack of strong shared interests, shifts in representatives and long-term commitment ultimately led to the stagnation of the initiative. This highlights the importance of other mechanisms, for instance stabilizing, as a business case was missing, and energizing, achieving the first step of developing the boxes did not lead to sufficient commitment to continue the collaboration.

This marks the importance of the second configuration recognized within the broadening trajectory, the alignment of interests and ambitions (Fig. 4). Many initiatives align with or are exemplified within specific policy ambitions such as the transition to circular agriculture (Hamletz, Orangebroiler, Future Farmers, Skylark Foundation, Agro-testing ground de Peel), increasing biodiversity and food production at the North Sea (Hatchery, Ark Oyster reefs, Proseaweed) and the Agro-forestry goal of 2030 (Food forestry Droevendaal, Testlab Tiny House & Forest).

In the case of Ark oyster-reefs, a consortium comprising NGOs, research institutes, a commercial oyster company and the government are working together to recover reefs at the North Sea. The main objective is to promote biodiversity and nutrient turnover by recovering the reefs, which have been affected by diseases. The initiative was originally initiated by NGOs, after receiving the fund of the National Postcode Lottery they were joined by more partners who were able to mobilize financial resources and bring in expertise (logic of attraction). The political agenda to increase and restore biodiversity in marine areas and the prospects of multi-use wind farms also gave the initiative momentum (embedding). The government started providing subsidies to explore different food production methods and restore biodiversity, while the commercial oyster company is pursuing the commercial upscaling of the cultivation of flat oyster breeds in the future. These interests and ambitions aligned within the consortium. To ensure success, the core executing group has kept its size small and made a clear distinction in tasks and roles (learning by doing and partnering).

The third configuration recognizable within broadening is characterized by establishing a focus and basis first. It involves laying a foundation (stabilizing) by ensuring the continuity of the initiative and achieving the first results (energizing) before connecting with other ambitions and domains through learning by doing and partnering (Fig. 5.). Embarking on an ambitious project that involves multiple domains and actors from the beginning is likely to face a prolonged period of uncertainty without tangible results to fuel and support its progress. For this reason, energizing and stabilizing can be recognized as key mechanisms, next to learning by doing and partnering, for initiatives to successfully broaden.

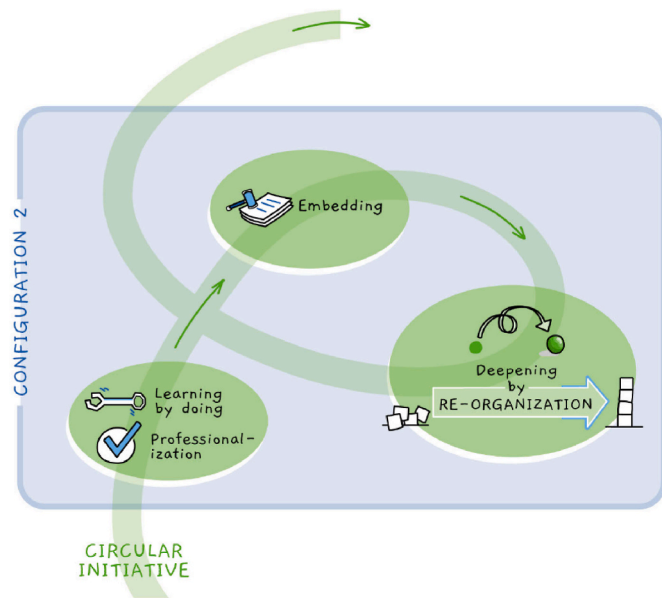


**Fig. 1.** Configuration 1: the mechanisms of energizing, learning by doing and partnering facilitate re-focusing, enabling the initiative’s deepening.

and deepen its ambitions. Its next step is to differentiate based on materials and the recycle potential.

**4.2. Broadening through cooperation with unusual collaboration, aligning interests and by establishing focus**

Three configurations were identified for initiatives’ broadening. The first identified configuration is unusual collaboration through energizing, logic of attraction, partnering and learning by doing. Whereas the unusual collaborations are for instance among NGO’s, private and public actors. The presence of commitment and trust (energizing), an appealing narrative or idea which lowers financial and/or legislative barriers to connect different domains (logic of attraction) is important



**Fig. 2.** Configuration 2: the mechanisms of professionalization, learning by doing and embedding facilitate re-organization, enabling the initiative's deepening.

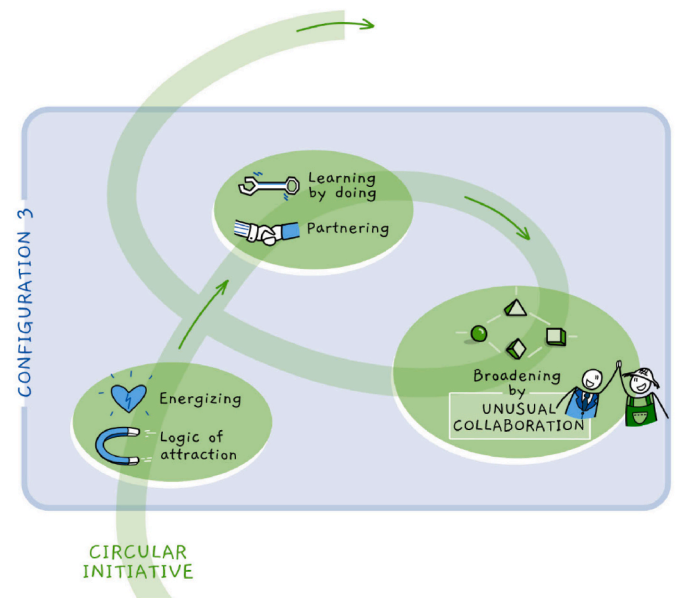
The initiative Grassa consciously made the choice to narrow their focus to stabilize and attain concrete results (energizing) before pursuing broadening (Fig. 5). Grassa aims to convert grass into higher-value products using biorefinery technology. Originally starting as a research project in 2004, the aim since 2014 is to become a commercial business. Though it initially focused on high-value products such as meat replacements and paper made from grass fibers, Grassa has narrowed its focus to livestock feed and fertilizers. This decision was made due to the less complex nature of these products and the limited resources available. However, the project aims to broaden its scope in the future once a strong business case is established for its current applications.

#### 4.3. Spreading through increasing capacity, credibility and offering perspective

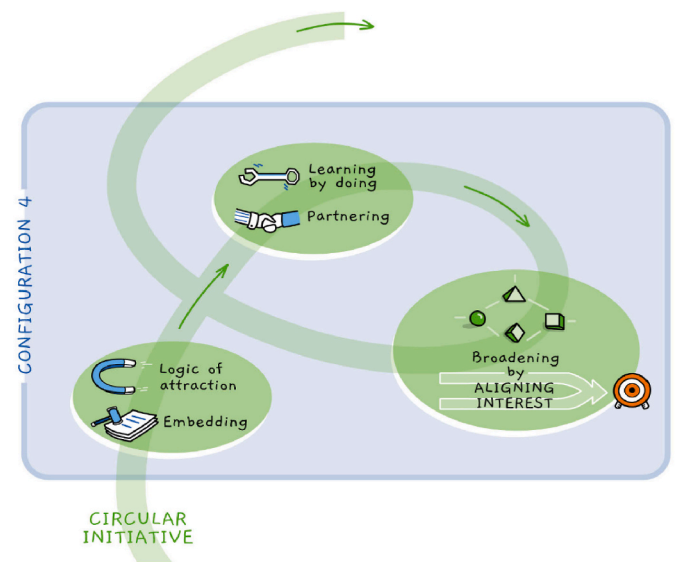
Three configurations were identified through which initiatives' spread: increasing their capacity, credibility and offering perspective. Increasing an initiative's capacity takes place through professionalization in combination with logic of attraction. When an initiative is successful in realizing its first results and through this positions itself as 'a winner'. This attracts more resources such as partners, members and funding and the positive attention can lower legislative and financial barriers. The increase in resources and attention requires the initiative to organize and professionalize while the deriving improved capacity and outreach can help the initiative spread (Fig. 6).

For example, the Plastic Soup Foundation, began as a group of intrinsically motivated volunteers with a background in media, who wanted to raise awareness about the issue of increasing plastic waste in the oceans. Despite initial difficulties in securing funding, the foundation's success in agenda setting eventually garnered public visibility. This attracted the attention of the National Postcode Lottery, which provided crucial funding. This success, in turn, attracted other resources and partners (logic of attraction), allowing the initiative to develop a structured organization and increase its outreach (professionalization).

The second configuration for spreading, increasing credibility, focuses on ensuring the continuity of initiatives through professionalization and stabilizing (Fig. 7). This involves initiatives being recognized as a concrete alternative for current practices rather than just temporary or

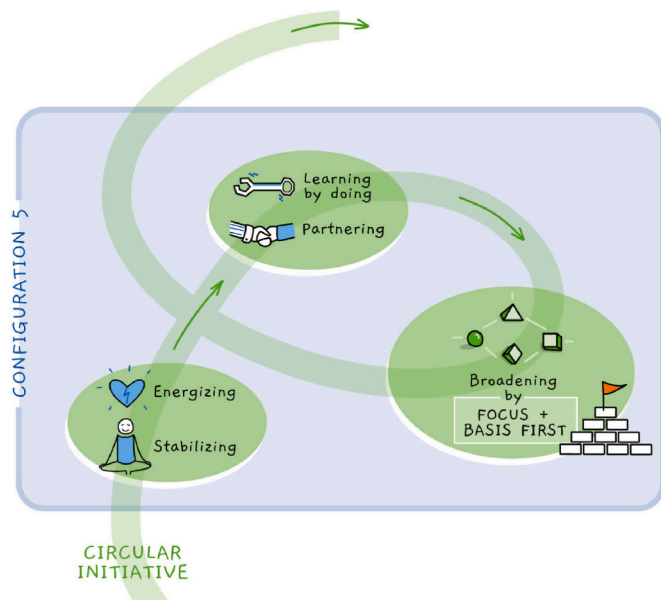


**Fig. 3.** Configuration 3: the mechanisms of energizing, logic of attraction, learning by doing and partnering facilitate unusual collaboration, enabling the initiative's broadening.

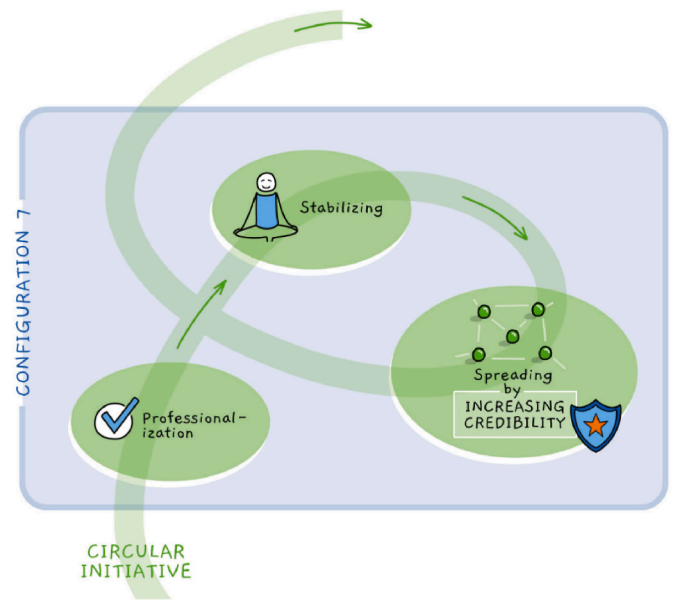


**Fig. 4.** Configuration 4: the mechanisms of embedding, logic of attraction, learning by doing and partnering facilitate aligning interests, enabling the initiative's broadening.

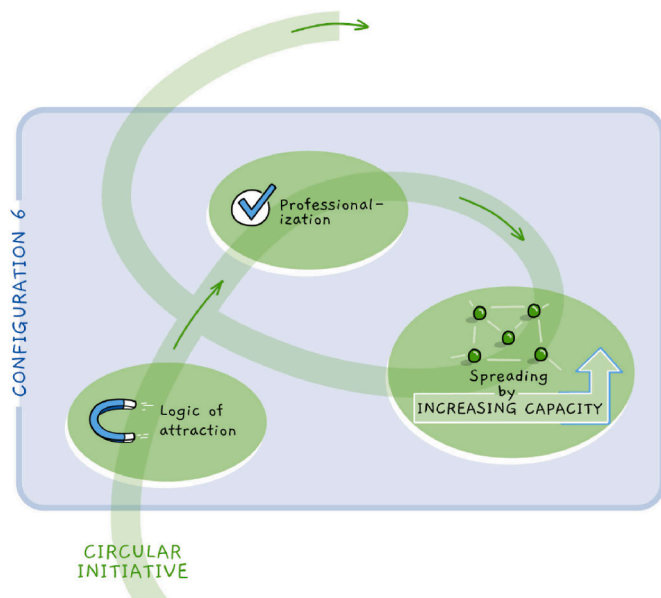
locally embedded efforts. Professionalization helps initiatives to stabilize by increasing their credibility through e.g., choosing the right legal form (e.g., foundation, business, cooperation), monitoring and demonstrating their results (e.g., Cultivation New Style and Ark Oyster-reefs) and becoming a structured organization with committed representatives enables initiatives to be invited for advice and input, and be involved in policy processes. For instance, Future Farmers developed from exchanging knowledge among agro-ecological farmers to also representing this group. Together with organizations focused on community supported agriculture and bio-dynamic farming, Future Farmers developed into a representation organization called the Federation of Agroecological Farmers (professionalization). Together they can advocate their interests more effectively and become part of official meetings about circular agriculture (stabilizing).



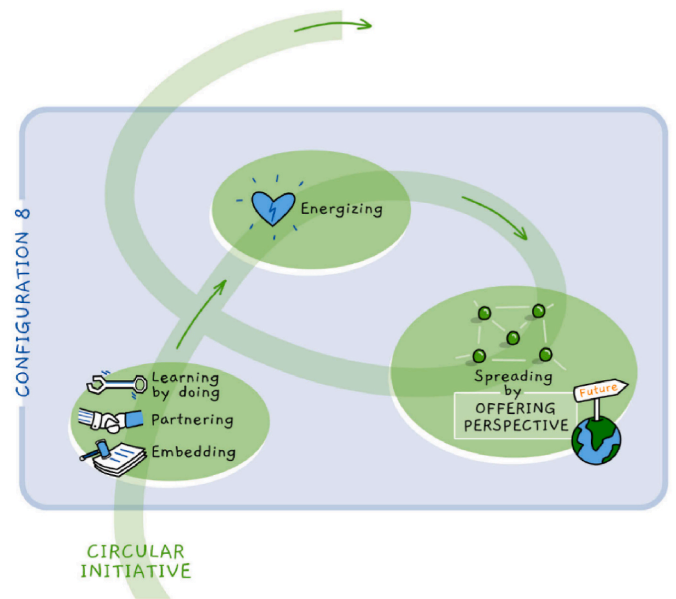
**Fig. 5.** Configuration 5: the mechanisms of energizing, stabilizing, learning by doing and partnering facilitate focus and provide a basis, enabling the initiative's broadening.



**Fig. 7.** Configuration 7: the mechanisms of professionalization and stabilizing facilitate increasing credibility, enabling the initiative's spreading.



**Fig. 6.** Configuration 6: the mechanisms of logic of attraction and professionalization facilitate increasing capacity, enabling the initiative's spreading.



**Fig. 8.** Configuration 8: the mechanisms of learning by doing, partnering, embedding, and energizing facilitate in offering perspective, enabling the initiative's spreading.

The third identified configuration is called offering perspective, which is realized through the combination of learning by doing, embedding, partnering, and energizing (Fig. 8). This configuration is clearly visible within the Zero Discharge Strategy for greenhouse horticulture, a covenant organized by the sector and producers focused on minimizing the disposal of fertilizers and pesticides in the water. The initiative was already rooted in a partnership through Platform Sustainable Horticulture (partnering). Furthermore, whereas the enforcers and waterboards first had a control function they shifted their approach to advising and cooperating with the producers, increasing the transparency and trust (partnering and energizing). Together bottlenecks and barriers were identified, and solutions demonstrated to the producers (learning by doing and energizing). Furthermore, governmental institutions (Ministry of Agriculture, Nature and Food Quality, national

government and the waterboards) recognized the initiative as a concrete alternative for other legislation focused on the purification of water, and as already an implementation of the objective set in 2027 for the whole sector (embedding). This increased the willingness amongst the producers (energizing and spreading) as it offers a clear future perspective for the horticulture.

### 5. Discussion

The paper aimed to empirically explore how configurations of mechanisms contribute to the deepening, broadening and spreading of circular initiatives. The analysis was based on 31 initiatives, of which thirteen cases showed deepening, fourteen cases broadening, and eleven cases spreading. Eight configurations were identified for these three



trajectories. Initiatives were deepened through reorganizing and adjusting focus, facilitated by different mechanisms. Broadening was facilitated by mechanisms which stimulated unusual collaborations, alignment of interests, and the establishment of a focus and basis. In the case of spreading, mechanisms that together increased capacity, credibility, and offered a future perspective were crucial.

This research complements existing literature on system-level dynamics, such as regime configuration (Bui et al., 2016), social tipping points (Lenton et al., 2022), and leverage points (Linnér and Wibeck, 2021), by focusing on the small-scale dynamics of initiatives. Moreover, the perspective on mechanisms, encompassing social processes such as the energy within the initiative to persist and develop (energizing), expands beyond the narrow view of initiatives' development based solely on market indicators or technology uptake (Augenstein et al., 2020; Bögel et al., 2022). This resonates with other frameworks in the literature underlining transformation as primarily a social process requiring social innovation (Avelino et al., 2019; Dias and Partidário, 2019).

Diverging from frameworks that emphasize 'multi-level' (niche, regime, landscape) and 'multi-phase' dynamics (emergence, take-off, acceleration, and stabilization), the small wins perspective emphasizes moderate-scale, continuous, concrete results achieved by initiatives across society, encompassing business models, covenants, legislation, foundations, consortia, and beyond. This perspective is consistent with previous literature that acknowledges the non-linearity of change and critiques the oversimplification of initiatives' development into pre-defined phases such as 'starting,' 'scaling up,' or 'acceleration,' or oversimplified S-curve models (Augenstein et al., 2020; Bögel et al., 2022; Ehnert et al., 2018; Loorbach et al., 2017; Lam et al., 2020). This paper challenges the prevailing trend that conceptualizes acceleration solely as upscaling (Augenstein et al., 2020; Lam et al., 2020; Bögel et al., 2022) by instead characterizing it as deepening, broadening, and spreading (Moore et al., 2015; Lam et al., 2020; Salo et al., 2022).

The framework builds upon previous conceptualizations of mechanisms (Bours et al., 2022; Ehnert et al., 2018; Gorissen et al., 2018; Lam et al., 2020; Loorbach et al., 2020; Termeer and Metze, 2019) in understanding initiatives' development but distinguishes itself by studying the combinations of these mechanisms. Instead of viewing acceleration as an exponential take-off, this paper argues that it involves the constant alignment of multiple mechanisms to ensure a next step toward deepening, broadening, and spreading. Applying this framework to an extensive empirical case set revealed the combinations of central mechanisms for specific development trajectories.

However, the framework's focus on transformative change at the initiative's level also has limitations. The study did not focus on how initiatives *together* bring about transformative change towards a CBE and thus challenge systemic structures, belief systems and routines. The development of individual initiatives should still be combined with other pressures for change, such as prefiguration through social movements and collective action, which further diffuses new narratives, ambitions, and alternative social norms (Yates, 2015; Monticelli, 2021; Signori and Forno, 2019). Furthermore, our framework does not explicitly address the importance of power relationships and discursive lock-ins (Lamine and Marsden, 2023; Simoens et al., 2022).

Our results have implications for initiatives, and other actor designing actions and strategies. To influence an initiative's deepening, broadening, and spreading requires diverse types of interventions, depending on which mechanisms are already present. Steering change processes solely through individual mechanisms is unlikely to be effective. Additionally, these mechanisms are essential, not only during the initiation phase but also throughout each step. Hence, merely creating an environment for initiating experiments is insufficient for generating long-term impact. The results indicated that certain combinations of

mechanisms are likely to reinforce each other, and interventions could be tailored towards these specific combinations.

For instance, the findings emphasized the need to balance energizing and stabilizing circular initiatives. Although energizing an initiative is crucial for its success, as it is present at some point within almost all our studied initiatives, there are limits to which an initiative can keep up the energy. Too much momentum can also create stress and unrest. Therefore, it is important for an initiative to stabilize before focusing on further deepening, broadening, and spreading. In other words, when initiatives want to take the next step -for example, by developing a new concept - the actors involved should assess the balance between energizing and stabilizing. This emphasizes the need to stabilize transition activities throughout the initiatives' development, also described as 'maintaining' the transition process (Löhr et al., 2022). The required balance between energizing and stabilizing also relates to the balance between having the space to experiment and learn, and the tendency towards projectification, in which, e.g., all focus and time goes to achieving project goals to ensure subsidies or short-term results (Torrens and von Wirth, 2021).

Future research could analyze the role of mechanisms in how different initiatives interact and together foster transformative change. Moreover, even though the study contains a case set of 31 initiatives, the conclusions are still explorative, and future research could provide more evidence on how various configurations result in deepening, broadening, and spreading. Future research could also address the contextual conditions in which mechanisms interact and contribute to initiatives' development. Lastly, more (transdisciplinary) research is needed to explore interventions and actions aimed at deepening, broadening and spreading initiatives.

## 6. Conclusions

The paper aimed to empirically explore the dynamic development of circular initiatives through which they contribute to the transformation to a circular bioeconomy (CBE). To achieve this goal, the study focused on the relationship between three distinct development trajectories – deepening, broadening, and spreading – and eight steering mechanisms, including energizing, partnering, professionalization, embedding, logic of attraction, learning by doing and embedding. The dataset consisted of 31 circular initiatives within agriculture, nature, marine, and bio-based products, which aim to contribute to a CBE and have shown some first tangible results. The study's main scientific contribution lies in offering comprehensive insights into how these mechanisms configure to foster initiatives' deepening, broadening, and spreading. Although the cases were all set in the Dutch context, the results provided broader insights on circular initiatives' dynamics and change processes.

The eight deriving configurations demonstrate how relevant mechanisms facilitate these development trajectories. Two key configurations were identified for deepening through which the initiative becomes more radical and circular: refocusing and reorganizing. Three main configurations were identified for broadening through which initiatives connect with other domains and agendas: unusual collaboration, alignment of interests, and establishing a basis. Three key configurations were identified for spreading, through which initiatives grow and become more numerous: increasing capacity, credibility, and offering perspective.

This paper demonstrated the added value of studying mechanisms in configuration, instead of isolation, for understanding initiatives' deepening, broadening and spreading. Strategies and interventions are likely more effective when focusing on multiple mechanisms to support initiatives' ambitions. Lastly, this approach provides opportunities for advancing initiatives' ambitions as mechanisms can strengthen each other, making concrete results more feasible.

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## CRediT authorship contribution statement

**O.M. Schagen:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing, Project administration. **T.A.P. Metz:** Conceptualization, Data curation, Funding acquisition, Methodology, Supervision, Writing – review & editing. **E.M. de Olde:** Conceptualization, Data curation, Supervision, Visualization, Writing – review & editing. **C.J.A.M. Termeer:** Conceptualization, Formal analysis, Funding acquisition, Resources, Supervision, Writing – review & editing.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

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## Appendix A. Description of the first and second step of the data analysis

The first step of our data analysis was identifying the occurrence of the development trajectories of deepening, broadening, and spreading across the initiatives. The second step was the identification of the eight mechanisms across the initiatives. Table 4 shows the occurrence of deepening, broadening, and spreading within the 31 initiatives.

**Table 5**

Presents the occurrences of the development trajectories of deepening, broadening, and spreading across the 31 initiatives, categorized as ‘strong’, ‘medium’ and ‘not observed’.

Development trajectories (31)	Strong	Medium	Not observed
Deepening	14	7	10
Broadening	13	5	13
Spreading	11	5	15

Within the development trajectories three categories were distinguished: ‘strong’, ‘medium’ and ‘not observed’ (see also Table 1). ‘Not observed’ refers to the initiatives in which these developments were not identified or very limited. However, it is of course possible that in the future these developments will be visible within the initiatives, similar as it is possible that these developments (temporarily) stagnate within other initiatives. Another observation to be noted is that initiatives also broaden, spread, and deepen at the same time. The other categories will be explained through examples of the cases.

‘Strong’ deepening, with concrete and realized results of becoming more circular or radical, was visible in, for example, the Kwatrijnstable. This dairy farm concept next to a nature reserve, had adjusted and thus deepened their concept by improving the stable to reduce ammonia emissions. ‘Medium’ deepening was visible within initiatives who are developing concrete plans but are not yet realizing these. For example, the New Dairy Farmer who plans on increasing transparency about food production with the aim to communicate to consumers why higher food quality entails a higher price.

‘Strong’ broadening entails achieving concrete results through connecting with other domains, sectors, and agendas. For example, Remeker, a biodynamic dairy farmer, started pioneering with organizing a collective fund for buying land. Land for the use of (extensive) farming is expensive, through the land lease fund citizens can purchase certificates and become a member of the Remeker land cooperation. ‘Medium’ broadening in which plans are made which connect domains, sectors and agendas is visible within Cultivation New Style. The initiative’s core focus was reducing CO<sub>2</sub> emissions through less energy intensive cultivation practices and it has successfully reached producers (approximately 1000 producers have followed the course). Currently the initiative is orientating if it can integrate other ambitions such as minimizing chemical pesticide use and improving water quality, through this it could potentially broaden.

An example of ‘strong’ spreading, meaning becoming larger and more numerous and showing this in concrete results, is the initiative of Zero Discharge Strategy within the horticulture. The initiative positions itself as an alternative for the practice of purifying discharge water by avoiding discharging into the water in the first place. This initiative has been spreading amongst producers and approximately thirty percent of the sector is now officially (recognized by enforcers) aligned with the initiative and not discharging into water. ‘Medium’ spreading, entailing the making of concrete plans to spread, could be identified in the expansion of Nedvang abroad, as Belgium and Germany are in the process of experimenting with the same concept for waste collection.

**Table 6**

Presents the occurrences of the eight mechanisms across 31 initiatives, categorized as 'strong', 'medium' and 'not observed'.

Mechanisms (31)	Strong	Medium	Not observed
Learning by doing	27	3	2
Partnering	17	9	6
Embedding	5	12	15
Stabilizing	7	11	14
Replicating	6	7	19
Logic of attraction	16	7	9
Professionalization	11	7	14
Energizing	15	10	7

Within the mechanisms the categories of 'strong', 'medium' and 'not observed' were also distinguished (see Table 2 for definitions). Table 5 provides an overview of how often certain mechanisms are visible within the cases. Learning by doing occurred in almost all the initiatives (27), meaning that the actors involved in an initiative were reflective on their practices and approach, flexible in adjusting accordingly, and created space for experimentation. Many initiatives engaged also in partnering, either in close committed collaborations with shared goals (17) or in more loose ties (9). Logic of attraction (16), energizing (15) and professionalization (11) were frequently present. Embedding and stabilizing were identified less frequently and more often at a medium strength. Many initiatives were medium embedded (12), meaning that their approach and design was incorporated into ambitions, agendas or they are organized within communities of practice, but not translated into concrete planning, budgets, or regulations. Strong stabilizing was less present (7), as it is difficult to stabilize initiatives. Many initiatives were still vulnerable because of their dependence on volunteers, subsidies and high start investments or the lack of a secure business model, making it difficult to ensure long term continuity. However, more actors internalized the importance of the initiative, visible in the high occurrence of medium stabilizing (12). The visibility of replicating was limited (6), as the mechanism was often not observed (19). However, this absence should be attributed to replicating occurring often outside of the immediate context of an initiative, which was a factor not covered in the dataset. Consequently, the low presence of replicating does not necessarily imply the absence of replicating but rather reflects the dataset's constraints.

**Appendix B. Extended version of the description of the 31 circular initiatives. In which the last column presents which configuration was present within an initiatives' development. 'D1' refers to the first configuration of deepening, 'D2' to the second configuration of deepening, and similar for broadening (B1, B2, B3) and spreading (S1, S2, S3)**

Name	Timespan	Brief description of initiative	Deepening (D)	Broadening (B)	Spreading (S)	Configuration
Plastic Soup Foundation	2011-ongoing	Non-profit foundation focusing explicitly on plastic and its effects on health and environment.	Raising awareness to focus on solutions/action perspectives.	Focus broadened to plastics as health hazard and education.	Wider reach, internationalization, increase in volunteers	D1, B3, S1, S2
Ark Oyster reefs	2016–2019 Continued in follow-up project	Foundation involved in nature development at the North Sea, including the recovery of shellfish reefs to increase biodiversity.	Next to multi-use also advocating for the purpose and right of oyster reefs on its own, by aiming for Marine Protected Areas (medium).		Increase to two locations. Setting up its own breeds to develop oyster reefs spat on shell.	D1, B1, B2
Temporary Nature	2017- ongoing	Foundation focused on legislation to make temporary nature areas possible on fallow land.	Letting go of the idea of maintenance of the temporary nature area. Developed from Green Deal project to foundation.		Increase to 3915 ha divided across 61 terrains. Spreading of the concept to Germany.	D2, S3
Future Farmers	2015-ongoing	Foundation connecting and representing agro-ecological farmers, by advocating for solutions within legislation, and land access (Hoes et al., 2022).	Applying commons thinking on land (lease contracts). Developed from knowledge exchange to representative organization.	Connecting different topics and issues within agricultural transformation.	Increase in members (from 20 to 300). Merging with other organizations into the Federation of Agroecological farmers.	D1, D2, B3, S1, S2
Green Circles	2013-ongoing	Different partners organized within a foundation aimed at long term cooperation and organizing projects and processes to increase circularity and sustainability.	From a focus on electric transport trucks to electric vehicles on water			D1, B1
Remeker	1985-ongoing	Dairy farm producing cheese and working according to biodynamic principles and minimizing external inputs.	Developing holistic approach to soil.	Pioneering with collective purchasing of land.		D1, B3
Hamletz	2007-ongoing	Circular farm with arable farming (incl. lupine as pig feed), pigs (higher animal welfare) and biogas installation.	Improving the housing system.	Next to animal welfare also incorporating the environmental footprint. Communicating about the certification of 'Beter Leven'.	Increase (temporarily) in availability in supermarkets.	D1, B1, S1
Grassa	Research project in 2004, business since 2014	Biorefinery technology converting grass and making it applicable for higher functionalities and as a source			Increasing capacity of the installation for grass refinery.	D2, B3, S1

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Name	Timespan	Brief description of initiative	Deepening (D)	Broadening (B)	Spreading (S)	Configuration
The New Dairy Farmer	2016-ongoing	of protein (replacing the import of soy). Currently focused on animal feed. Farm focused on producing soy in the Netherlands and processing it for local soy-based milk.		Increasing the transparency and awareness about soy production (medium).	Developing the processing installation for the locally produced soy (medium).	B3, S1
Proud of Yerseke	Family business since 1942	Collaboration between private (such as Roem van Yerseke) and public actors on setting up a large-scale project to recover natural flat oyster reefs		Combination of ecological research and the potential prospects of commercial offset.	The size of the breeds is growing. Norway and USA started experimenting as well.	B1, B2, S2
Kwatrijn-stable	2015- ongoing	Organic dairy farm cooperating with the Natura 2000 nature reserve. It has an innovative stable with low ammonia emissions and higher animal welfare.	Improvements of stable to reduce ammonia and now focusing on methane emissions.	Connecting dairy production with nature conservation. Experiments with agroforestry, integrating fodder trees.		D1, B1, B3
Orange-broiler	1997 – ongoing	A circular farm combining organic arable production (47 ha) with broiler production (partly fed with leftovers from the crops).	Stronger ties between poultry part and arable farming part of the farm to increase circularity.			D2, B3
Circle value	2014, transitioned into Circle value in 2019	A collaboration of three public waste management organizations, who share knowledge and combine household waste streams to improve and increase re-use and recycling and to reduce household waste.	Focus shifted from organizing the waste collection most efficiently to integrating policy and implementation to reach better results. Further organizational and technological innovation.	Connected with social ambitions such as creating social working places and creating local employment.	Through cooperation with other municipalities reaching 25 % of the volume of the Netherlands of packaging plastics for sorting and processing.	D2, B3, S3
Biofoam	2006- ongoing	Biofoam aims to replace Styrofoam, based on petroleum, with a biodegradable and circular alternative (polylactic acid)		More applications of the foam in surfboards, construction sector, packaging of electronics and food, as alternative for car tires rubber used in artificial turf.		B1
Nedvang	2013-ongoing	Nedvang registers, monitors, and encourages collection and recycling of packaging waste.	From covenant to a tax system and further developed to an extended producer responsibility system through an independent waste fund. Improvements through differentiating between material types and recyclability of the packaging.	Is being used as example for other packaging streams such as cars and mattresses (medium).	Belgium and Germany are also experimenting with a similar system (medium).	D2, B3, S2
Rodenburg Biopolymers	1945-ongoing	Since 2000 experimenting with bioplastics. Packaging based on starch from food leftovers. This can substitute the use of petroleum and extend the shelf life of products.	Focus shifted towards extending the shelf life of products through packaging (medium).			D1
Proseaweed	2017–2022	Research program focused on the possibilities of large-scale seaweed production, and its combination with wind energy at the North Sea.	The derived knowledge led to better insights on how to realize offshore seaweed production and research questions for a follow-up project (medium).			D1
Tomato-fiberbox	2013–2015	Consortium which developed a box consisting of fibers of leftover tomato plants which would otherwise be composted or fermented.	Focus developed from developing boxes out of tomato fibers to also having an antifungal function, increasing the shelf life of tomatoes (medium).			D1, B1
Value of Water	2020- ongoing	Consortium aimed at improving water use within the horticulture to contribute to a climate proof water system.				
Zero discharge strategy Horticulture	2012- ongoing	Covenant to reduce the discharge of fertilizers and pesticides to a minimum by closing the water cycle.		Exploring connections with drought- and flood prevention (medium).	30 % of horticulture sector implements the zero-discharge strategy.	S2, S3
Cultivation New Style	2009- ongoing	Consortium around a novel approach to horticulture, characterized by using significantly less energy. This approach has spread across the	Exploring the integration of different hormone, mineral and ecological knowledge of plants (medium).	The primary focus is on Co2 reduction but has been expanded with attention for reducing pesticide use and the	Increasing number of producers following the program (around 1000). A widespread movement that adopts this new cultivation technique.	B3, S2, S3

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Name	Timespan	Brief description of initiative	Deepening (D)	Broadening (B)	Spreading (S)	Configuration
Testlab Tiny House & Forestry	2014-ongoing	sector leading to a reduction of energy use and carbon emissions. Pilot project proposing the combination of tiny houses and forestry to make an attractive alternative when converting privatized agricultural land into forest.		fertilizer discharge into the surface water (medium).	A variety of initiatives across the Netherlands but not fully realized yet (medium).	B2, B3
Impaqt	2018–2021	European research project focused on developing a management system for integrated multi-trophic aquaculture (IMTA) in coastal areas and at sea to control and monitor an IMTA farm remotely from shore.	Shifted focus from the IMTA towards being an example and driver of realizing mussel production at sea.			D1
The Mobile Yard	2017–2020 transitioned into another concept	A foundation around a diversified farm concept without land but works the land of private owners in exchange of knowledge and 10 % of the harvest.	Focus on specific location and possibilities there (medium).	More products and crops.	No desire to grow further than 50 households.	
Agro-testing ground de Peel	2016-ongoing	'A community of practice' containing different projects, experiments and pilots which are taking place in a close connection to the direct area and environment.	Further developing good practices such as composting biomass use for soil improvement and particulate matter reduction.	Variety of projects that e.g., combine nature conservation and farming, and public engagement to reduce particulate matter.	Growing as a network and in access to land (from 5 to 35 ha).	D1, S2
Food Forestry Droevendaal	2018- ongoing	Food forestry project, connected to Wageningen University & Research, combining research with community development to create consciousness, experience, inspiration, and education.	Aspiring to be more self-sufficient as food forestry (medium).	Focus more on eco-literacy and making the university more sustainable (medium).	Financier stimulates growth in projects. Increase in volunteering students.	B2, S1
Skylark	2002–2019 foundation since 2009	Foundation initiated by farmers and companies in the food chain aimed at sustainable land management. Through study groups farmers engage in knowledge sharing and continuously improve their farming practices.	Focus shifted from focus on developing a business model towards knowledge exchange as main motive amongst members. Together with monitoring.	Educate agricultural advisors about healthy soils for better yields. Knowledge of arable farmers exchanged with chain partners and research.	First increased in members and partners but later this declined. 22 out of 39 regional groups continued within a new similar initiative.	D2, B1, S2
Urban Farmers	2016–2018	Rooftop farm in The Hague, combining a greenhouse with aquaponics using Tilapia fish. Aimed to produce high quality food with a low environmental footprint in the city while connecting citizens with local food production.		Visitor center with education and tours about this type of food production.		B3
New Mixed Farm	2004 – ongoing	Agropark aims to create a closed system with large scale pig and broiler farming, arable farming, a slaughterhouse and produce bioenergy. This makes it possible to close nutrient cycles, possibly improving animal welfare and limiting transportation.		Cooperating entrepreneurs around a poultry farm, a pig husbandry, and a manure processing installation.		B3
Greenport Venlo	2007–2012	Pilot project combining the development of an agro-terrain with increasing nature and improving the landscape.	Next to Floriade exhibition no concrete results.		Transitioned into Brightlands campus since 2019.	
Testing ground Natura 2000	2011–2018	Different pilot projects within livestock farming, next to Natura 2000 areas to experiment with measures to reduce ammonia emissions. Involvement of farmers, knowledge institutes and governmental actors.	Further develop ammonia emissions reducing measures and evaluate these on their effectiveness and applicability.			

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