

RESEARCH

Open Access



Understanding the organisational dynamics and ethos of local degrowth cooperatives

Giovanni Cunico^{1*} , Sebastiaan Deuten² and I-Chun Huang³

Abstract

As a concept challenging the growth paradigm, degrowth is put into practice in different ways. Ones of which are degrowth-oriented cooperatives: organisations composed of producers and consumers that intend to keep a locally oriented focus and embrace more responsible economic practices to promote socio-ecological sustainability. Despite their flourishing relevance, a robust understanding of their functioning is still missing. This becomes essential to comprehend how they differ from normal cooperatives and support their diffusion. Therefore, this work investigates the internal organisational dynamics in a degrowth cooperative through a case study. We used a participatory system dynamics modelling approach involving the cooperative's members to develop a causal-loop model describing the cooperative's main functioning. Several dynamics appeared to take place within the cooperative, reinforcing ones favouring cooperative growth and balancing ones limiting its expansion. While growth dynamics and conflict emergence resemble normal cooperatives' behaviour, limiting mechanisms, depending on the local focus and the potential setting of income sufficiency thresholds, are expected to prevent the cooperative from excessive expansion and lose its degrowth ethos. Moreover, the participatory modelling method used appeared to contribute to improving the members' understanding of the problems, identifying shared solutions, and enhancing communication. This study's contribution is two-fold: first, it reports the organisational dynamics of a cooperative practising degrowth and, second, highlights how participatory modelling can be a powerful tool in those contexts to increase members' engagement and enhance communication.

Keywords: Cooperative, Ethos, Degrowth, Community-led sustainability actions, Grassroots initiative, Participatory System dynamics modelling

Introduction

Nowadays, the growth paradigm on which our societies rely is being challenged out of the concerns over sustainability (Wiedmann et al., 2020). Research is converging towards considering modern dominant lifestyles based on the pursuit of affluence-growth as one of the main drivers and causes, if not the most important, of climate change and environmental degradation (Beckage et al., 2018; Bradshaw et al., 2021; Görg et al., 2020; Wiedmann et al., 2020). Natural resource over-exploitation,

ecosystems degradation, and biodiversity loss (IPCC, 2021) are just a few results showing how the current consumption lifestyle is not only undermining future generations' opportunities to meet their needs (Brundtland, 1987) but also putting at risk the lives of people more susceptible to the consequences of climate change. At the same time, it is believed that the constant pursuit of affluence and economic growth also have negative social impacts. For example, it generates increments in social inequality and instabilities (Massey, 1996; OECD, 2020), unequal wealth distribution within countries (Balestra and Tonkin, 2018; Piketty, 2014), reduced social bonds (Bartolini et al., 2013), unstable financial sectors (Mills and Davies, 2013), disenfranchised people

* Correspondence: giovanni@cunico.org

¹Business School, University of New South Wales, Sydney, NSW 2052, Australia

Full list of author information is available at the end of the article

related to a loss of trust in public organisations (Mills and Davies, 2013), and “stationary or declining levels of subjective wellbeing, despite growing income and consumption levels” (Jackson, 2008, p. 703).

As a result, more and more people began looking for new, different, and sustainable lifestyles, pursuing a deep transition towards new socio-ecological futures. Among the pool of new narratives and paradigms proposed and discussed (Harangozo et al., 2018; Urhammer and Röpke, 2013) (e.g. green growth, steady-state growth, harmonious society, Buen Vivir), degrowth appears to play a key role. Recent evidence highlights how materially downshifted lifestyles are needed to be sustainable (Hickel and Kallis, 2020; Wiedmann et al., 2020), making it necessary to decrease the current level of consumption (i.e. negative growth-degrowth), or increase although in a different manner (i.e. positive growth-green growth) and warns of the risks of maintaining current levels (i.e. zero growth-steady-state growth). Thus, degrowth was born as a reaction to the ruling idea of growth in our societies and its hegemony (D’Alisa et al., 2014; Schmelzer, 2015). It aims to change society from the current one, in which consumption and production patterns are out of control, to another one in which people voluntarily consume fewer resources through new ways of living (D’Alisa et al., 2014). Given that it is still a concept in the making, degrowth results in an open project (Demaria et al., 2013; Videira et al., 2014) in which common people, activists, and scholars play important roles in the development of the idea, constantly adding new features to the paradigm.

Although degrowth has neither been implemented nor fully realised on a large scale anywhere yet, the domain of possible ways to put degrowth in practice locally is continuously increasing over time through very active grassroots activists. One of the possible ways is local cooperativism (Johanisova et al., 2013; Johanisova et al., 2014; Kallis et al., 2012; Kallis and March, 2015; Khmara and Kronenberg, 2020) since it can shorten the supply chain and hence decrease the carbon footprint, increase financial stability, focus on members’ value rather than shareholder profit, strengthen social relationships, and generate more attention on the state of the local environment (Dombi, 2015). Cooperatives are generally thought to have the potential of alleviating the aforementioned pressing social and environmental sustainability issues (Mills and Davies, 2013).

Local cooperatives following degrowth principles (*degrowth cooperatives*) receive increasing attention from researchers, practitioners and activists, as they are considered promising niches in which the degrowth paradigm can incubate, and from which it can diffuse (Khmara and Kronenberg, 2020). Degrowth cooperatives differ from regular cooperatives by explicitly rejecting

growth-oriented business models, and instead aiming to achieve (and not exceed) levels of wealth sufficient for their members’ good living, thereby discouraging the mere pursuit and accumulation of affluence (although the borders between these two stances remain fluent [see Rommel et al., 2018]). Moreover, while regular cooperatives can aim for growth beyond a local area, degrowth cooperatives tend to have a locally oriented focus as it is more in line with degrowth principles. Research focused on how cooperatives can contribute to achieving degrowth objectives in specific domains is emerging, such as agroecology (Boillat et al., 2012) or renewable energy production and consumption (Kunze and Becker, 2015; Rommel et al., 2018), or on adopting specific habits, such as local currencies and social debt (Balaguer Rasillo, 2021). However, in contrast to what has been done for other degrowth grassroots practices like ecovillages or ‘squats’ (e.g. Cattaneo and Gavalda, 2010; Lockyer, 2017; Roysen and Mertens, 2019), where more detailed descriptions of their operations and practices are available, an analysis on the internal and organisational dynamics of degrowth cooperatives is missing, i.e. on the processes and actions driving its functioning. Developing in-depth analytical knowledge on such an aspect is not trivial. First, it is fundamental to anyone (e.g., practitioners and activists) desiring to support their diffusion and enhancement. For instance, it can help identify promising policies to improve degrowth cooperatives conditions or weaknesses. Secondly, from a more theoretical standpoint, it allows comprehending to what extent they are similar to or different from other degrowth initiatives and regular cooperatives. Besides providing an interesting cross-fertilisation opportunity between degrowth and cooperativism research, this could show to what extent future research and practical interventions could draw from established degrowth grassroots initiatives and cooperativism literature.

To start filling this gap, in Spring 2016, we performed a case study project with a ‘start up’ degrowth cooperative in Portugal called Segredo (pseudonym) as it offered an appropriate fit for the scope of the research. The project adopted an action research approach (Lewin, 1946), in which researchers pursue transformative change by developing specific problem-solving actions for organisations (i.e. helping Segredo with its challenges) and parallelly do research thanks to the better organisations’ understanding gained (i.e. improving knowledge on degrowth cooperatives’ dynamics; Bradbury, 2015). Such an approach has been fruitfully used to study cooperatives (Proka et al., 2018) and degrowth grassroots initiatives (Lockyer, 2017). Participatory System Dynamics Modelling (PSDM) method was used, involving cooperative members in developing a causal model describing the organisational and social functioning of Segredo.

PSDM was selected since it is an established method to deal with complex and multi-stakeholder systems (Stave, 2010; Vennix, 1996) like degrowth cooperatives.

This paper is structured as follows: in the “Background” section, we introduce the main features of degrowth and cooperatives and describe the case of Segredo. In the “Method” section, the method is outlined. The project results, consisting of the causal diagram for cooperative dynamics and feedback from the cooperative, are reported in the “Results” section. A “Discussion and analysis” section discusses the insights gained and reflects on the method’s usefulness and the limitations of the research. Finally, the “Conclusion and further research” section describes the conclusions.

Background

Degrowth

Fundamentally, degrowth is a critique to the prevalent growth paradigm, typical of capitalist societies, functioning as a political slogan that discourages imagining unrestrained growths in profit and materialistic wealth, and the proliferation of the socio-economic structures that keep it in place (Kallis and March, 2014; Latouche, 2010). It advocates that endless economic growth must be replaced with other social goals and that human well-being is not solely or predominantly dependent on wealth accumulation (D’Alisa et al., 2014). Among the many definitions available, a popular one defines degrowth as “an equitable downscaling of production and consumption that increases human well-being and enhances ecological conditions at the local and global level, in the short and long term” (Schneider et al., 2010, p. 512). Accordingly, degrowth perceives growth to be uneconomic, unjust, and ecologically unsustainable since any levels of consumption will never be considered enough. Therefore, degrowth rejects other emerging ideas such as green growth or green economy because they still incorporate an undebated positive vision of the concept of growth in their agenda (Demaria et al., 2013), which can potentially still harm the planet (Hickel and Kallis, 2020).

Thus, the degrowth movement rejects the common practice of commodification and refuses economic indicators, like GDP (Costanza et al., 2014; Schmelzer, 2015; van den Bergh, 2009), as the main guideline for society’s decision-making (D’Alisa et al., 2014). Next, it emphasises the importance of simplicity, sharing, conviviality, commons, sufficiency, decision-sharing, and care for others and ecosystems as the new milestones (D’Alisa et al., 2014; Jarvis, 2019). Therefore, this basic definition makes it not a simple concept but a framework that accommodates different ideas and proposals (D’Alisa et al., 2014). Within this framework, other core ideas not strictly related to the economic aspect of the paradigm

have been developed, proposing additional nuances to the degrowth vision (Ariès, 2005; Asara et al., 2013; Demaria et al., 2013): degrowth as a way to preserve intrinsic ecosystem value, degrowth as a proposition to change the current dominant anthropological paradigm of *homo oeconomicus*, degrowth as a movement for social justice and as a response to the lack of democratic debates in modern societies, etc.

Beyond mere criticising of growth, degrowth suggests various approaches from a local to a global scale to promote paradigm transformation (Demaria et al., 2013). Due to the wide variety of the approaches, it is not surprising that they might not be completely compatible with one another (Demaria et al., 2013; Schwartzman, 2012). As Latouche (2010) states, degrowth suggests a multidimensional exit from the capitalistic world intellectually and practically and at individual and collective levels. These practical ways to practice the degrowth view can take many different forms (Demaria et al., 2019; Demaria et al., 2013; Khmara and Kronenberg, 2020; Sekulova et al., 2013). For example, work-sharing, car-pooling, voluntary simplicity, zero-waste strategy, ecovillages, cohousing, local currency systems, collective ownership, social enterprises, and voluntary changes in lifestyles consumption. (Brossmann and Islar, 2020; Demaria et al., 2019; Jarvis, 2019; Johanisova et al., 2013; Kunze and Becker, 2015; Lietaert, 2010; Sekulova et al., 2013; Xue, 2014). And, as said, local cooperatives are one of these possible ways.

Cooperatives

According to the International Cooperative Alliance (ICA), a cooperative is defined as an “autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through jointly-owned and democratically controlled enterprises”¹. The main economic purposes pushing people to form and join cooperatives include lowering the fixed costs, increasing sales and turnovers, improving marketing, and sharing the costs and knowledge (Göler von Ravensburg, 2011). This type of organisational structure is applicable to different kinds of enterprises and sectors, leading to four main categories: producer or worker coops, consumers’ coops, credit coops (or credit unions) and farmers’ buying and selling coops (Johanisova et al., 2013, 2014). A cooperative can be classified into more than one category, such as one formed at the same time by producers and consumers. For example, renewable energy cooperatives with particular attention to limiting consumption growth (e.g. Kunze and Becker, 2015), can be seen as producers and consumers’ coops since cooperative members can be

¹<https://www.ica.coop/en/cooperatives/what-is-a-cooperative>

part of the energy production process as well as to purchase it. However, in countries where renewable energy cooperatives are diffused, like Germany (Yildiz et al., 2015), being a consumer and producer at the same time ('prosumers'²) is not necessarily the main or unique driver for becoming a cooperative member. In fact, people also see energy cooperatives focusing on electricity production as an attractive financial investment in times of low-interest rates as the produced electricity is fed into the power grid and the producer receives a fixed feed-in tariff. Nonetheless, being a part of a cooperative is not just for gaining economic competitiveness. ICA identifies seven key principles that distinguish cooperativism from the other way of doing business, including voluntary and open membership, democratic member control, members' economic participation, autonomy and independence, commitment to education about the ethos and practice of cooperation, cooperation among cooperatives, and concern of the sustainable development of their communities.

The contribution of cooperatives to sustainability can be elaborated from the economic, social, and environmental perspectives. The economic one lies in its "member-focused" management. For instance, a cooperative operates in the interest of its members rather than the shareholders, making its finance intrinsically less risky (Domby, 2015; Mills and Davies, 2013). In addition, a cooperative tends to focus on its members' needs and utility instead of on mere profit, releasing itself from the short-termism typical of usual companies (Johanisova et al., 2013, 2014). Moreover, a cooperative has economic value, as its operations tend to keep the currency circulating in the local community and support the local economy. From the social perspective, a cooperative creates social capital among members such as self-confidence, resilience, and trust. Besides, it also enhances the relationships between its members and the local community (Domby, 2015; Mills and Davies, 2013). Finally, from the environmental perspective, a cooperative's participatory style of management and ownership makes it easier for the members to raise their concerns about externalising environmental impacts, if any, without the necessity of considering the environmental impact in terms of return on investment (Göler von Ravensburg, 2011). Also, the strong connection between a cooperative and the local community causes its members to be more concerned about the local environment than a typical company owned by distant shareholders (Domby, 2015; Mills and Davies, 2013). Furthermore, the

local production and consumption promoted by a cooperative movement could contribute to developing a low-carbon economy (Johanisova et al., 2014).

Nevertheless, many modern cooperatives that began with a strong *ethos* have lost it and became predominantly driven by profit (Johanisova et al., 2013, 2014). For example, the economic pressure from a competitive environment might make the members less willing to follow the principles of local and fair trade since it can be more costly. In addition, as cooperatives grow and expand, the management of the cooperatives may become so complex that the members get passive in the management, letting the managers assume all the power. Over time different strategies have been adopted to address these undesired trends of development and to stick cooperatives to their ethos (Johanisova et al., 2013, 2014), including engaging the members more and educating them about the ideas of cooperativism, building mutual relationships among cooperatives, and limiting the size of cooperatives so as to keep members' loyalty to original principles.

There are also other practical issues cooperatives have to face (Göler von Ravensburg, 2011), for example maintaining good relationships among members, retaining a healthy and efficient cooperative structure, constructively resolving internal conflicts, reaching and maintaining a certain size to survive and serve its members during difficult economic times, being able to keep the initial spirit despite the member turnover or the increasing number of paid staff.

New attempts of intertwined cooperativism practices with degrowth ideas are increasing (Johanisova et al., 2014; Suriñach Padilla, 2012). These initiatives include local organic food networks, farm cooperatives, barter markets, time banks, local currencies, community gardens, community housing, health cooperatives, renewable energy coops, child care, alternative currencies etc. (Balaguer Rasillo, 2021; Boillat et al., 2012; Chiengkul, 2018; D'Alisa & Kallis, 2020; Kallis and March, 2014; Khmara and Kronenberg, 2020; Kunze and Becker, 2015; Rommel et al., 2018; Suriñach Padilla, 2012). In fact, cooperativism offers a promising and established framework for degrowth activists to put into practice their aspirations. First, they share similar values (e.g. people involvement and engagement, commons). Second, cooperatives legally adopt a form of governance in line with the degrowth principles (i.e. democratisation and decision-sharing). Thirdly, as elaborated above, cooperatives can contribute to economic, social, and environmental sustainability, which are the main objectives of the degrowth movement.

Segredo cooperative

Segredo is a local cooperative putting into practice degrowth principles in the Alentejo region in Portugal,

²Cooperatives offer a possible platform for the surge of prosumer movement (e.g. Mashlakov et al., 2021), i.e. the emergence of people producing many of their goods and services in substitution of being mere consumers (Kotler, 2010; Ritzer et al., 2012).

with its operations centred around a small municipality of 15,000 inhabitants. It is a rural area in the centre of the country with a strong tradition of collectivism and cooperativism: right after the Portuguese Revolution (1974) many collective farms were born there, but they had difficulties competing, and over time, the land went back to be managed by traditional private businesses (El País, 2013). Within this cultural context and in a precarious economic situation faced by the whole country, in July 2015, Segredo was legally established.

It purports to promote economic, environmental, cultural, and social sustainability practices by providing people with diverse products locally produced by some of its members. Segredo aims to be 'integral', or multi-sectoral, namely it wants to incorporate all the necessary elements to live (e.g. food production, housing, education, energy and health care) (the case of *Cooperativa Integral Catalana* offers an interesting parallel-Chiengkul, 2018; Kallis and March, 2015). Moreover, Segredo would like to try to fulfil social functions (e.g. education, job security, and provision of basic goods at a reasonable price) when they are not fulfilled anymore by traditional institutions (e.g. government, family). Integrating these social functions into an economically active cooperative would provide access to resources in additional ways than just markets (e.g. volunteer work, subsidies, and sponsorships). Furthermore, in line with degrowth principles (D'Alisa et al., 2014; Jarvis, 2019), the cooperative aims to support sharing knowledge and resources and promote conviviality and togetherness.

Segredo became operative around 3 months after its foundation when the cooperative inaugurated a store for offering members' products (e.g. food, handcrafts, ceramics, cosmetics, furniture, building material, music instruments) and services (e.g. business support, architecture, web design, veterinary). By enrolling mostly local producers and service providers as members, Segredo seeks greater local autonomy of consumption and contributes to a stronger local economy by trying to keep currency inside the community. Moreover, similar to other degrowth initiatives (Roysen and Mertens, 2019), Segredo appears to be more open than regular businesses to experiments and innovations that may find it hard to be developed and attempted in the usual market contexts (e.g. production of furniture from locally recycled material).

Although progress has been made since its inauguration, at the time of this project (April and May 2016) Segredo was facing some severe issues, despite the great effort of some of its members. Nine months after its establishment, it has not yet reached a size that ensures the survival of and full help for its members. The liquidity was not high enough for Segredo to be sustainable. For instance, the manager's work is not paid, and the

wages of the cooperative staff are lower than the country's average.

Method

In March 2016, the authors came into contact with Segredo's staff and agreed to perform a PSDM intervention to identify the internal and local barriers hindering Segredo's sustainability. In light of an action research approach, on the one hand, this allowed the authors to gather crucial information which would have been otherwise hard to access (research development side), while on the other one, Segredo's members got the opportunities to raise their voices and contribute to the identification of problems and solutions (organisation problem-solving side).

The case study approach is a fruitful way to inductively investigate new empirical domains, collect data, and formulate propositions and hypotheses. For these reasons, case studies are rather common in degrowth research when exploring aspects that have not been significantly covered by the literature. For instance, case studies have not only been used already to analyse degrowth cooperatives (Balaguer Rasillo, 2021; Kunze and Becker, 2015) but also other degrowth practices like urban squats (Cattaneo and Gavalda, 2010), ecovillages (Lockyer, 2017; Roysen and Mertens, 2019) and other types of degrowth experiences (Buhr, Isaksson, and Hagbert, 2018; Demaria et al., 2019).

Given Segredo's characteristics, it provided a promising case as it presented the basic features expected in degrowth cooperatives. Moreover, activists are not always aware of being part of a degrowth-inspired initiative. They often start or get involved for sustainability and anticapitalistic motives, and their efforts are labelled as degrowth only a posteriori by researchers (e.g. Cattaneo and Gavalda, 2010). Instead, Segredo explicitly states to follow the principles of degrowth. Finally, its willingness to open up its internal processes, practices, and concerns to an external research team made it an ideal opportunity to reconstruct degrowth cooperatives' dynamics. Overall, all these elements contributed to the extent to which the findings from this case can be transferred to other degrowth cooperatives. However, limitations to the generalisations of the results may still remain and are discussed in "Generalisations and limitations" section.

Participatory system dynamics modelling

System dynamics (SD) is a methodology for studying complex systems (Forrester, 1961; Sterman, 2000), drawing particular attention to the system's underlying structure of cause-effect mechanisms and how those affect the system trends and visible events. It offers a holistic approach by emphasising how different aspects are

interrelated in a complex system. Specifically, in SD, causal models (also called causal/causal-loop diagrams or systems maps) are used to visualise and crystallise the web of causal interrelationships among the multiple factors involved. These models are then used for qualitative or quantitative analysis to explore the problem's dynamics.

Variables and arrows are two key components in an SD model. A variable is a factor that is conceptually quantifiable. Arrows represent the causal relations, in which the variable at the tail of an arrow is referred to as the “cause variable”, while the variable at the head is often called the “effect variable”. Positive causal relations mean that a change in the causing variable ‘adds to’ the effect variable, or that they move in a similar direction (given all else stays equal). In the case of a positive relation, an increase in the causing variable results in an increase in the effect variable, and a decrease in the cause variable leads to a decrease in the effect variable, considering the expected influence for the majority of the contexts. In contrast, the negative causal relationship means that a change in the causing variable ‘subtracts from’ the effect variable, or that they move in opposite directions (again, given all stays equal). For a negative relation, an increase in the causing variable results in a decrease in the effect variable, and the opposite: a decrease in the cause variable generally leads to an increase in the effect variable. Positive and negative causal links can form paths that result in feedback loops. Two types of feedback loops are distinguished: reinforcing or balancing. Reinforcing loops (denoted with R) can cause exponential development, starting off slow but increasing in

the pace of change. That development can cause both increasing levels in variables or decreasing levels, depending on the initial direction of change, leading to exponential growth or decay. Balancing loops (indicated with a B) are completely different: limiting or counteracting growth, causing development to slow down, and making sure a system comes into balance or does not spiral endlessly out of control. Any systemic behaviour can be explained by an interplay of reinforcing and balancing feedback loops. Policies can be designed to strengthen or reduce the effects of feedback loops or introduce new feedback effects to a system. Figure 1 portrays a simple example of a causal model with balancing and reinforcing feedback loops.

Participatory system dynamics modelling (PSDM) is a facilitated modelling approach for engaging stakeholders, subject experts, policy-makers, and communities in one or multiple stages of a system dynamics (SD) modelling process through the use of facilitation techniques (Stave, 2010; Vennix, 1996). Besides improving the understanding of complex systems, by facilitating the participants to share their perspectives, the approach can enhance the participants' learning, support them to reach consensus on how to solve the problem, and build their commitment to the implementation of the solution (Scott et al., 2016; Vennix, 1996). PSDM was employed in this study because a cooperative is a complex system involving multiple stakeholders (i.e., members of the cooperative). In particular, due to the use of causal models and their suitability to clarify complex dynamics (Ford, 2009), PSDM has been shown to support stakeholders' ownership of the problem and increase their motivation toward change (Stave, 2010).

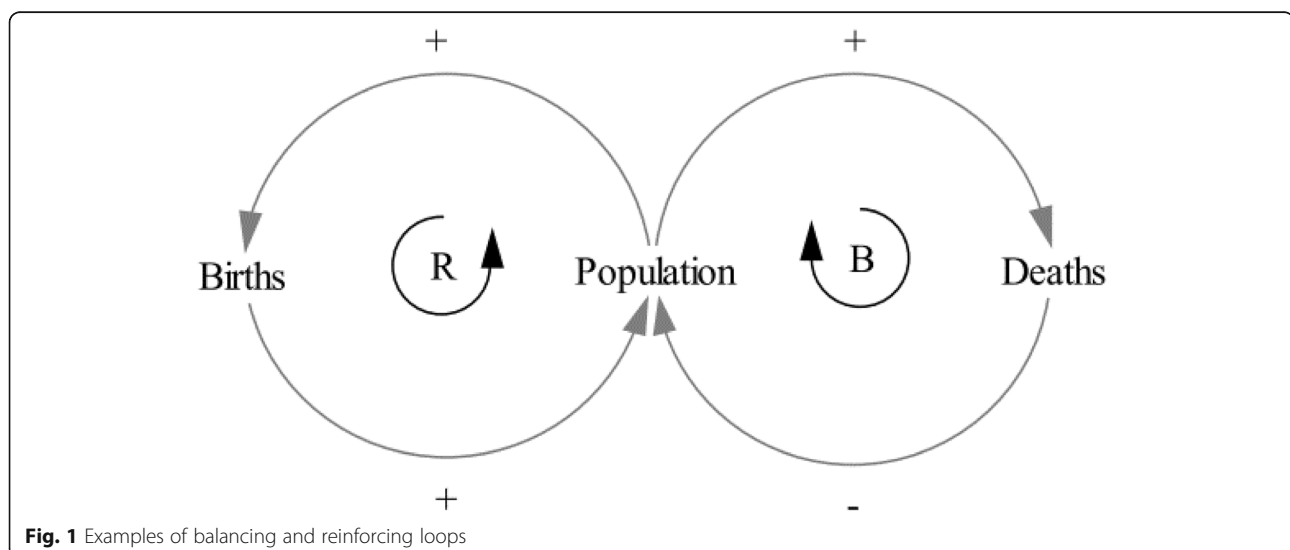


Fig. 1 Examples of balancing and reinforcing loops

The advantage of using the PSDM method to deal with the research gap identified compared to more common ones, like interviews or observation (e.g. participant observation, ethnographic investigation), used to investigate case studies in degrowth initiatives (e.g. Balaguer Rasillo, 2021; Buhr et al., 2018; Cattaneo and Gavalda, 2010) and cooperatives (e.g. Datta and Gailey, 2012; Lorendahl, 1996), consists in the co-production of knowledge. Interviews and observations tend only to capture the interviewee and observer perspective, while cooperatives are multi-stakeholder entities and participatory modelling methods, like PSDM, allow to engage members to create altogether a shared understanding of the cooperative functioning, which can also lead to deeper levels of knowledge thanks to structured group reflection (Vennix, 1996). Moreover, having them formalise their understanding in a model makes the results less susceptible to interpretation, as it could be in the case of verbal data (Whetten, 2014). However, PSDM entails some limitations related to the involvement of stakeholders in the model building process (Voinov et al., 2016). First, not all organisations or people want to take part in facilitated modelling projects or positively accept being challenged in such a way to discuss complex dynamics and problems (e.g. Gerrits and Vaandrager, 2017). Second, it is sensitive to how the workshop is facilitated. Specifically, suppose facilitators do not perform well in their role (maintain neutrality, allow everyone to speak, mediate tensions, promote discussion and critical reflection, avoid groupthink, etc.). In that case, they can significantly harm the quality of the outcome. Third, the knowledge to construct the model comes from the participants. If the group does not possess an exhaustive coverage of the items under discussion, the resulting model may not satisfactorily describe the system of interest. To constrain these limitations, several strategies were employed. Three facilitators conducted the workshop to ensure high-quality facilitation throughout the whole session. At the same time, the workshop was built following the best practices available in the PSDM literature (Andersen and Richardson, 1997; Vennix, 1996). Finally, including participants with the most diverse backgrounds and roles in Segredo.

Overall, SD has already been employed earlier to address degrowth challenges. However, most of the research has been focused on assessing the feasibility of degrowth on a macro level. D'Alessandro et al. (2020) and Jackson and Victor (2020) analyse the impact on economies at national levels. Đula et al. (2019) and Bennich et al. (2015) adopt an even higher global level of analysis to evaluate the feasibility of degrowth policies. SD has not yet been employed at a

micro level to explore the viability and challenges of the degrowth actions within organisations like cooperatives. Furthermore, PSDM has not been widely used in the context of degrowth. To the best of our knowledge, only Videira et al. (2014) adopted this method of engaging experts to map and integrate different degrowth proposals into a single model. Given that, this study appears to be the first application of PSDM in the context of a degrowth cooperative.

Process

The research-intervention was conducted within 2 months and designed to enable the members of Segredo to engage with the process as much as possible. After an initial preliminary interview with the manager to get to know each other, the process included members' interviews, one workshop with them, and a follow-up meeting with the manager (Fig. 2). Behind the scenes, a causal model was built based on the cooperative members' interviews and then revised with them during the workshop.

The interviews functioned to build rapport with the members, gather insight on their current understanding of Segredo and the local economy, and ask how to prepare the workshop (Appendix 1 reports the set of questions used as the starting point for the interviews). Six interviews were conducted: four with producers (producers of clothes, vegetables, furniture, and ceramics), one with a service provider, and one with the manager. Among the interviewees were three men and three women of relatively different age groups. Questions focused on their understanding of Segredo's functioning, how the revenues are earned and spent, and how the internal communication and interaction with other members occur.

After the interviews, the researchers converted the interview record into the initial version of the causal model by identifying variables and their causal relationships. Besides, the researchers also added some potential causal relationships that the interviewees did not mention explicitly. Those causal relationships inferred by the researchers were marked with a different colour, such that during the subsequent workshop, the cooperative members could decide whether to keep them in the causal model or not.

The workshop functioned mainly to gather feedback on the causal model built after the interviews and secondarily to establish ways to communicate the causal model to other or potential members (Table A1 in Appendix 2 reports the detailed workshop script followed). There were six participants in the workshop, among which five were previous interviewees. After introducing the concepts of causality, feedback loops, and polarity to the participants, the

initial causal model, drawn based on the interviews, was presented and the participants had some uninterrupted time to look at it for themselves and ask questions. Thereafter a group discussion took place in which the participants could have a further reflection on the causal model. Following the group discussion, they were grouped in triads to encourage their active participation and discussion about the model. The participants were then invited to draw on the causal model for making revisions. Each participant was asked to identify promising variables for creating a change (Table A2 in Appendix 3 includes the voting results). Before the end of the workshop, the researchers asked them to reflect on how the insights could promote changes and communicate the causal model to other or potential members. Finally, an evaluation was conducted in which every participant could provide feedback on how they experienced the session. It is interesting to note that, without asking for it, participants stated that the session changed their mental models.

The revisions and suggestions made by the participants were majorly focused on events affecting Segredo's relative attractiveness to locals, and local promotion. The added elements are *product quality*, *product price*, and *marketing by competitors*. These factors capture the influence of competition with the local supermarkets and effects of price and quality to Segredo's products relative attractiveness. In addition, *marketing strategy* has been added to portray the possibility of this affecting the local promotion. It was found that Segredo does not have a clearly defined marketing strategy yet.

Three weeks after the workshop, a follow-up meeting took place with the cooperative manager. The discussion was focused on the outcomes of the project. The authors delivered the revised causal model (Fig. 3) to the manager and then proposed and discussed with him a list of possible policies and strategies (see Table A3 in Appendix 4). Lastly, the manager provided feedback on the process and the outcomes.

Results

Model results

The information gathered from the interviews and the workshop was used to construct the cooperative causal model. It comprises 44 variables and 8 major feedback loops. In the paragraphs below, only the themes of the different loops are discussed. The exact relations among each variable can be found in the model pictured in Fig. 3 below (colours correspond with different sectors; dark green portrays elements of Segredo's staff, light green of the members, dark grey of the cooperative itself, medium grey of the local

community, and light grey from outside the cooperative). Figures 4, 5, and 6 are sectors of the causal model extracted from Fig. 3 for clarification.

The first loop (R1), called "money within cooperative" (Fig. 4), resembles the idea that the money spent by members in Segredo becomes the income for other members. When a greater amount of money is spent in Segredo (total sales) by both members and locals (sales to members and sales to other locals), this will result in an—on average—higher income for Segredo (total income) and its members (members' income from cooperative), further increasing their possibility and willingness to spend their money there. Those mechanisms generate a reinforcing loop, which shows how cooperative members' spending contributes to the growth of both their and the cooperative's incomes. In the causal model, this loop goes through two causal pathways. One captures that the higher the *members' income*, the higher their potentially spendable income in Segredo. The second, which goes through *willingness to spend money in Segredo* to *fraction of income spent in Segredo*, describes how Segredo's members tend to become more interested in spending their money within the cooperative when they realise the benefits on their income of Segredo's growth. This loop also illustrates the opposite, for when more money is spent elsewhere, this will decrease the other members' income, and this missed income cannot be consumed in Segredo anymore.

The second loop (R2), called "members' efforts to growth", shows how members can actively contribute to increase Segredo's business volume and benefit from it (Figs. 5 and 6). It occurs in two main ways. First (Fig. 6), increased sales positively impacts cooperative and members' income. When members realise the importance of the cooperative for their income, their *motivation to contribute to the cooperative* increases, making them spend more time contributing to the cooperative functioning (*members' time spent in cooperative*) and positively talking about it with other people (members talking about cooperative). This last generates a *word-of-mouth* effect, which increases *locals' awareness* about Segredo, eventually pushing locals to buy products and services from the cooperative. On top of that, if members spend more time in the cooperative, they can improve its performance making it more attractive to customers (either other members or locals) and selling more products, which in turn increases income and closes the loop. The second route of the "member effort to income growth" reinforcing loop (Fig. 5) captures the fact that if the *members' income* raises, then they can make more *individuals' investments* and sell more and better products and services (*types of*

products and services). This mechanism also triggers the activation of another nested and strictly correlated reinforcing loop (R3), “increase of product types and sales”. The greater and better variety of products and services will increase the attractiveness of Segredo, leading to more sales and higher income. On the one hand, this income contributes to raising *members’ income*, allowing them to make even more investments (closing the R2 loop). On the other, this income can be invested in *cooperative’s capacity* to increase the different *types of products and services* that can be provided (closing R3 loop). For example, with more space, more products can be displayed, and more workshops, meetings, or other service-related activities can be done; or a larger capacity attracts more members that can bring new products and services to Segredo.

The fourth major reinforcing loop (R4) driving Segredo’s growth is called “increase of members” (Fig. 5) and resembles a network effect from members to locals. As mentioned above, members talking about the cooperative generates a *word-of-mouth* effect, which can positively affect the *locals’ awareness* of the cooperative, push some of them to consider becoming members and contribute to the cooperatives’ growth and keep reinforcing the *word of mouth*.

The described mechanisms capture the key variables and loops driving the growth of a cooperative like Segredo. Clearly, the cooperative cannot grow forever as some external limiting factors exist. First, it operates in a competitive world which will hinder its growth as it competes with other businesses for the same pool of customers. Second, it has a local scope meaning that it does not plan to expand beyond the local community (i.e. the potential members and customers are limited to the locals). In addition to these growth controlling dynamics, which are more dependent on the external-environmental variables, some identified internal processes are slowing down Segredo’s expansion.

The fifth and sixth loops are called “conflict” (B1) and “effect of conflict on locals’ awareness” (B2) (Fig. 6). It is reasoned that, in the long term, the more *members* there are, the more likely it is that severe disagreements among members (*conflicts*) appear, and as a result, members might decide to leave Segredo. This is shown by the balancing “conflict” loop, impeding the growth of members. In addition, this kind of conflict can affect sales through a decreased *motivation to contribute to the cooperative*. When conflict arises, it decreases members’ motivation, negatively impacting the time they spend in Segredo’s activities and functioning (members’ time spent in cooperative) and how they talk about it (members talking about

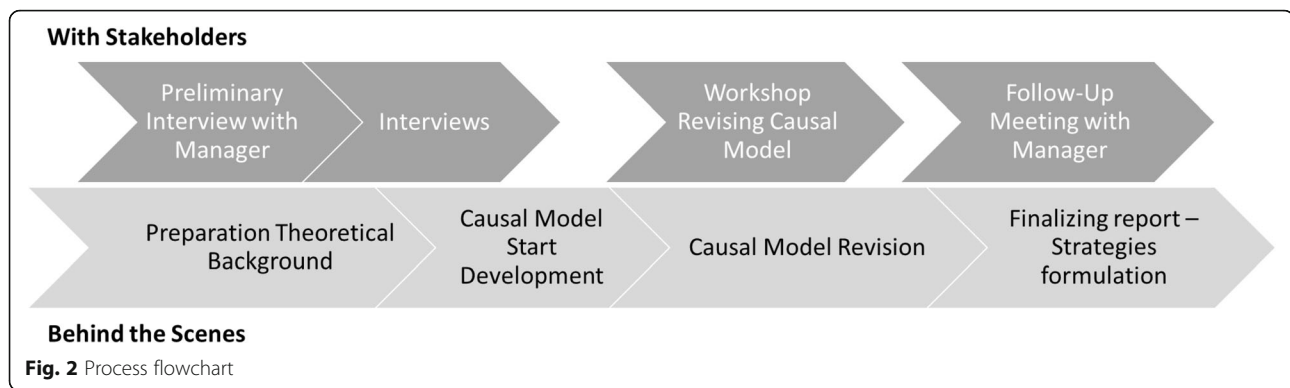
cooperative). This leads to lower sales (e.g. it hinders R2 “members effort to income growth”) and income that would otherwise have been realised, and subsequently also to decreased investments, capacity, and new members. This last causal pathway is depicted by the balancing “effect of conflict on sales” loop and can negatively impact all the previously discussed growth reinforcing mechanisms. Lastly, the seventh and eighth main internal mechanisms are “more staff more sales” (R5), and “limits to staff” (B3), respectively reinforcing and balancing loops (Fig. 4). The first shows that high levels of *staff* allow the cooperative to deliver high-quality work, increasing the cooperative attractiveness to locals, and free some of the staff from regular duties to do promotional work raising *locals’ awareness* about Segredo. In turn, this can increase sales and income, with which more staff can be hired. However, similarly to more traditional types of businesses, the total amount of staff is always limited by the total sales made, since the staff is paid with the revenues gained from the sales through Segredo (loop “limits to staff number”-B3).

The reported model captures and integrates the main internal dynamics and processes leading and slowing the progress and development of a newly formed local degrowth cooperative like Segredo. However, there does not appear to be signs of specific degrowth-related mechanisms. These last aspects were discussed during the interviews and workshop, and, although Segredos’ members were aware of the degrowth principles impact of their cooperative, they did not add those to the model, as these were not yet in place or strongly expected to occur in a short amount of time. More details and reflections on this are discussed in the “Degrowth ethos” section.

Finally, as described earlier, during the workshop, voting took place in which was asked to put dots on variables the participants found to be promising for creating a change. The top three variables that received the most votes were *locals’ awareness*, *marketing strategy*, and *members’ time spent in Segredo* (see Table A2 in Appendix 3 for the full results of voting).

Policies suggested

Given the spirit of action research (Bradbury, 2015; Denscombe, 2012), suggestions to improve the cooperative’s state were also provided to Segredo. Based on the causal model, three policy areas for Segredo were suggested (more details on the policies suggested can be found in Appendix 4). Specifically, the model was qualitatively analysed to identify the systemic leverages (Meadows, 2009), i.e. the variables with the highest potential to trigger the desired feedback loops and at the lowest costs. Those were then



compared and combined with the promising variables identified through voting during the workshop, to assess if the systemic leverages align with the members' understanding.

The first is to raise the local awareness and the relative attractiveness of Segredo. Several actions could help implement this strategy, such as developing a marketing plan and engaging members in the promotion activities. Next to that, encouraging members to spend more time within the cooperative can make locals more familiar with Segredo and alleviate staff's workload, allowing staff to have more time for promotion.

The second was to increase the cooperative awareness among members through more regular and more formal communication. For example, the cooperative could release regular reports or newsletters or hold regular gatherings for members. Next to that, Segredo can offer management training to its members for decreasing its dependence on the manager by making each member more autonomous. Also, facilitating the sharing of production costs through establishing a collaboration platform for offering and inquiring about services and equipment can increase the cooperative awareness while reducing total costs.

Lastly, having formal procedures for conflict resolution can be helpful in responding constructively to potential conflicts since internal conflicts are one of the greatest threats to the growth and sustainability of the cooperative in the long run (a more in-depth discussion on that is undertaken in the "Reflection on cooperative's dynamics" section).

Feedback from the cooperative

During the follow-up meeting, the final causal model was provided to the manager, together with the list of strategies developed by the authors, which the manager considered useful. In addition, the meeting was

functional to collect feedback on the project and process from the manager, which provided information on how the cooperative perceived and viewed the PSDM approach.

He expressed an overall satisfaction with the project, the results, and the way it was conducted inside the organisation environment. He perceived a positive impact on the cohesion in the group of participating members. In addition, he found some interesting insights into the policies suggested. He also reported that some members that attended the project had already started to change their behaviour towards the cooperative. These members began to participate more in the organisation's activities and daily life, contributing to the management of common spaces, for example, by cleaning the common rooms or helping other producers to bring their products to fairs. On top of that, the manager said that the members who attended the session appeared to be more patient to see the results of implemented policies. Lastly, the manager of Segredo even suggested the possibility of developing a toolkit based on this project to support other cooperative initiatives potentially facing similar challenges and complex dynamics.

To the best of our knowledge, given the last information at our disposal at the time of writing this manuscript, Segredo is now a more consolidated and well-running local cooperative five years later, increasing its members and expanding the services offered and products made that it delivers (e.g., eCommerce of local products, translations, attorney, photography and video making, etc.).

Discussion and analysis

The results offer three distinct types of insights that will be discussed in this section. First, the model provides interesting information on the dynamics of a cooperative practising degrowth. Second, the actual effect of the

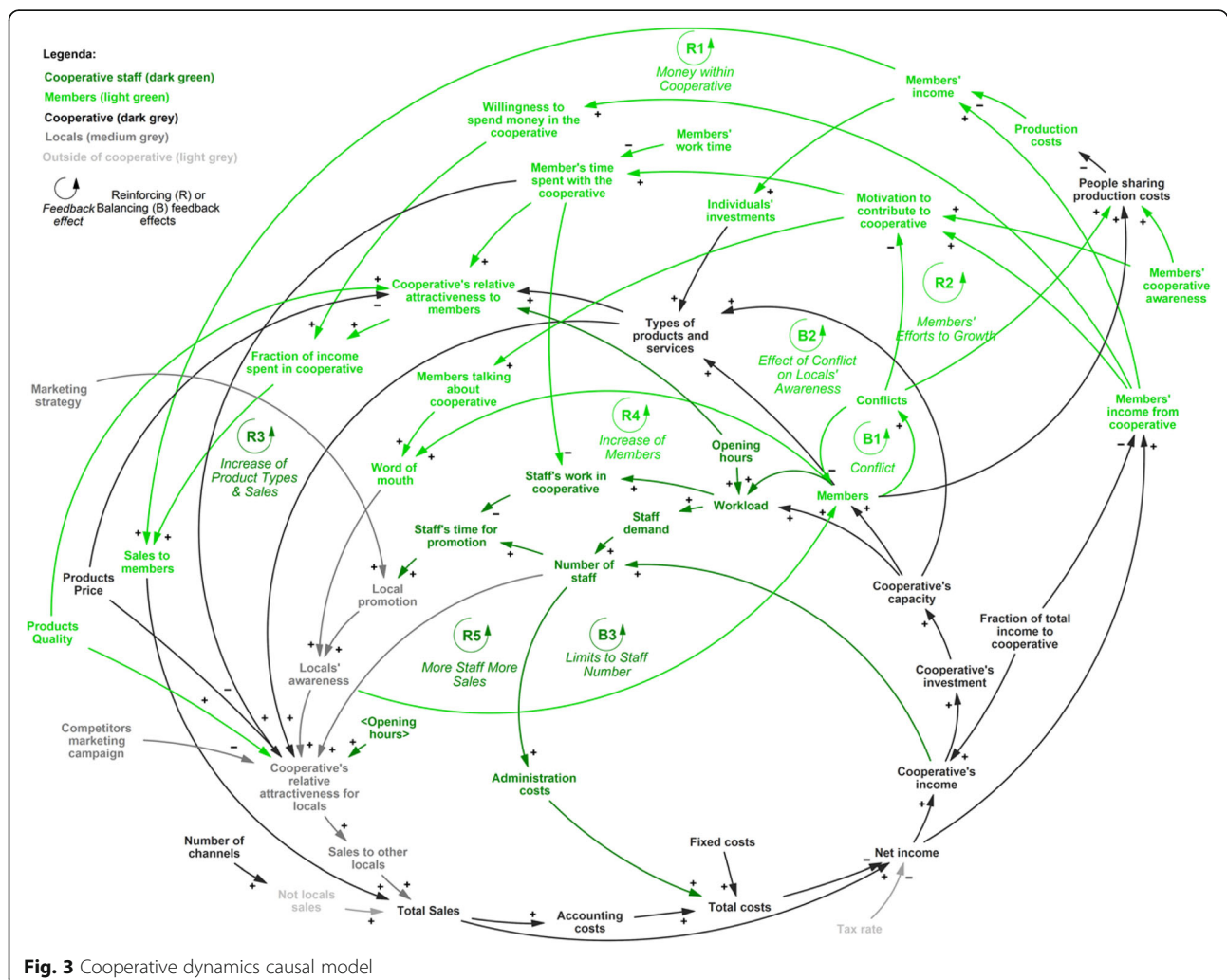
degrowth paradigm on the cooperative is elaborated. Third, how PSDM can positively impact the governance of a degrowth cooperative is analysed.

Reflection on cooperative's dynamics

At the time of the project, Segredo was facing problems that resembled marketing issues, which impeded revenues increase and financial sustainability. Segredo's store was still little known around the village. Next to that, along with cheap products, for example, bread and vegetables, Segredo sold some products that had a relatively high price, such as furniture and clothes. Lastly, the variety of products was not large enough to make consumers rely completely on Segredo only for their daily groceries. They still had to go elsewhere, which discouraged people from going to Segredo since they could also directly buy all their groceries in a supermarket, thereby saving time. Thus, the effort of Segredo was to 'trigger' reinforcing Loop

R1 ("money in Segredo"), R3 ("increase of product types and sales") and R5 ("more staff more sales"), which are typical mechanisms of economic growth that usual cooperatives (Cook, 2018), and companies in general, pursue. At first glance, this process may look like a contradiction with the degrowth principles. Instead, it signals that also for degrowth cooperatives, it is important to reach a specific size to become sustainable, which in the case of Segredo consisted of a specific amount of revenues guaranteeing long-term economic viability and future prospects to the project. In other words, degrowth cooperatives projects may contemplate an initial growth phase so to reach a level of sustainability, which could be not only economic but also, for example, social (i.e. the number of people involved in the degrowth project should be sufficient enough to guarantee success).

Concerning the case of the Segredo cooperative, the manager enacted a prominent role in its initial



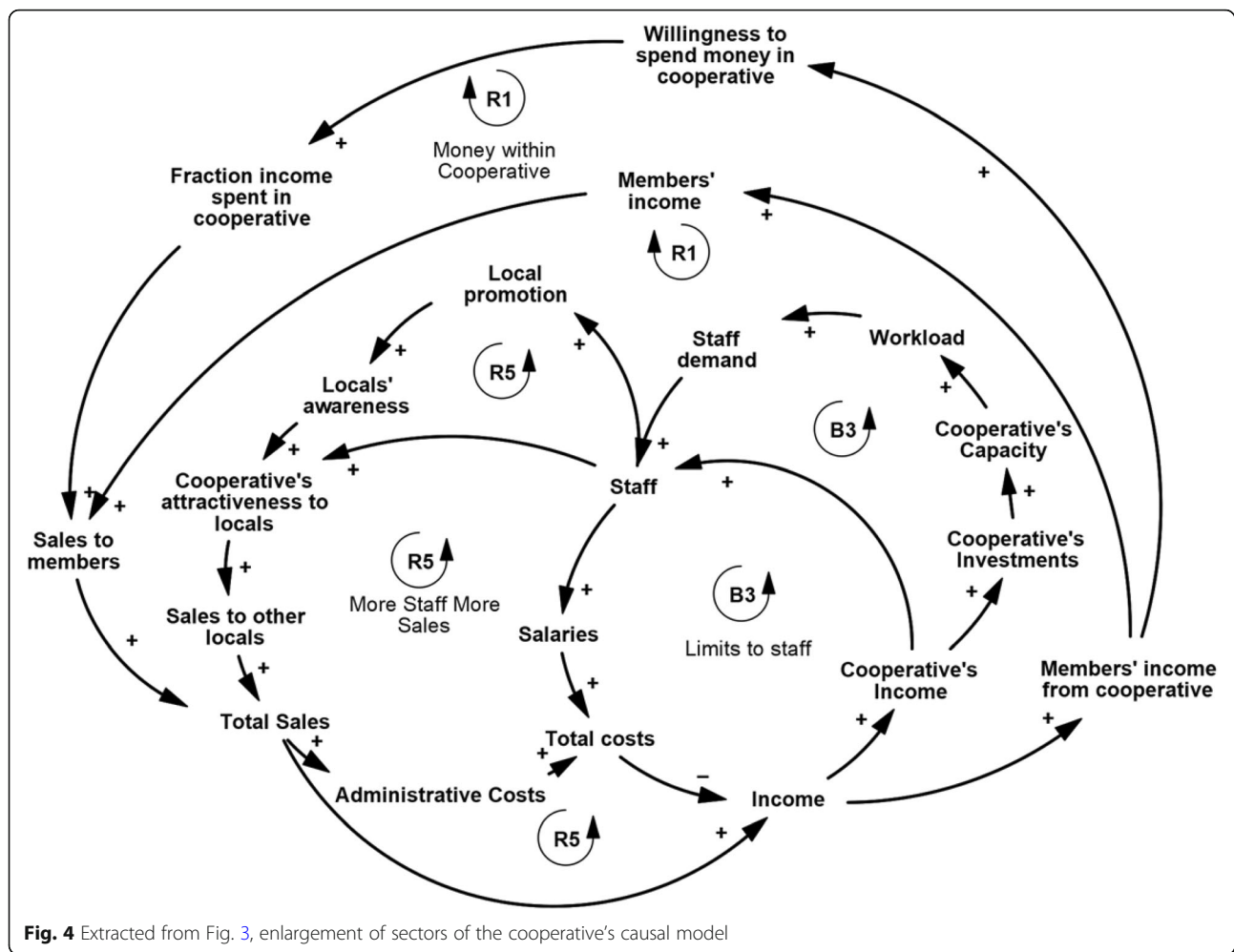
function. His role was more than that of a regular manager since he was the facilitator of all processes in Segredo, the person to whom every member talked to if they had a problem, distributor of products, and motivator of the members. In this way, he made sure of Segredo's survival with his effort. Furthermore, he supervised that the cooperative would keep its degrowth ethos and not deviate from traditional economic practices. From this perspective, it seems that, at least at the initial stages, people with strong motivations for the cause seem to be very important as they may significantly help to navigate through the turbulent times typical of newly born degrowth and cooperative experiences and increase their chances of survival. At the same time, with the prominence of their role, they can significantly contribute to protecting the organisation's values and normalising coherent practices among the members (Roysen and Mertens, 2019). This evidence corroborates existing knowledge on the importance of leadership (i.e. people intrinsically motivated driving the effort) in grassroots initiatives discussed in theory (Hossain, 2016) and found in other empirical cases (e.g. Hoppe et al., 2015). The causal model also offers insights into the limiting dynamics of Segredo's expansion. First, conflicts are a serious source of concern to the sustainability of the cooperative. Conflicts are implicit to people working together (especially in a context with a low hierarchical structure), and it is likely that, in the future, disagreements can result in members leaving Segredo, undermining its purpose and sustainability (captured by loops B1 "conflict" and B2 "effect of conflict on sales"). The causal model thus confirms the importance of conflicts in cooperative contexts identified in the literature (Sebhatu et al., 2020; Slade Shantz et al., 2020) and further highlights the relevance for cooperatives of adopting specific governance mechanisms to address conflict resolution (Brummer et al., 2017; Giglio et al., 2020). While the first limitation is an undesired one, the second one has a more positive connotation. It is imposed by the local scope of the project, deriving from the embracement of the degrowth paradigm. Segredo aims at maintaining a locally oriented focus (improving and strengthening the local economy) and therefore does not intend to grow beyond its local context. This dynamic will prevent Segredo from expanding too much, getting trapped in the growth competition treadmill and losing its ethos. In fact, Segredo's potential members and customers' base are limited to the local population and cannot exceed that limit. This can also be seen from the opposite perspective: if a degrowth cooperative loses its locally oriented focus, it may be

the case that it is growing too much and a signal that it has lost connection with the fundamental degrowth principles.

From a systems perspective, in the early phases, degrowth cooperatives may need to enhance the strength of reinforcing feedback loops to sustain growth until sustainability is reached. Then, in later phases, it will have to confront itself with balancing mechanisms (desired or undesired) that will tend to limit the project's expansion. So far, the story of Segredo follows the Cook (2018) cooperatives' model of development over time. After the initial founding moments, in which the motivation to create a cooperative increases (Justification phase) and it is succeeded by its constituency (organisational design phase), it follows a phase of growth (Growth-heterogeneity phase) where members numbers increase, as well as their heterogeneity and possibility of future conflicts. From this perspective, the evidence suggests that degrowth cooperatives initially resemble traditional cooperatives, displaying similar operative dynamics and challenges.

Degrowth ethos

Degrowth cooperatives are expected to stand apart from regular and more traditional ones by limiting their expansion and growth. In fact, pursuing growth should be done carefully, as the risks of growing too much and losing the degrowth ethos always remain (Johanisova et al., 2013, 2014). A way in which degrowth cooperatives limit their growth, as discussed above, is by 'being local'. The local focus derived by the degrowth principles limits the potential members and customers base, placing an external constraint to Segredo's expansion. However, interviewees and workshop participants also mentioned another anticipated mechanism limiting cooperative growth (Fig. 7). This was not included in the main causal model as it is not a process that is in place yet within the cooperative but is still at a wishful thinking stage. In Fig. 7 below, the black structure provides a very high-level representation of the cooperative growth reinforcing loops presented earlier: if the cooperative grows, *member's income from cooperative* will do the same and, more in general, also *members' income*, in turn stimulating members to put more effort to sustain the cooperative expansion (contribution to cooperative's growth) further. At the same time, the *degrowth ethos* is expected to generate a parallel balancing loop ('degrowth paradigm'), slowing down the 'cooperative growth' loop. In line with the spirit of degrowth, a sufficiency level defining what is enough for members should be identified (*members' desired income*). So, the stronger the degrowth ethos, the lower the *sufficiency threshold* and *members' desired income*. This

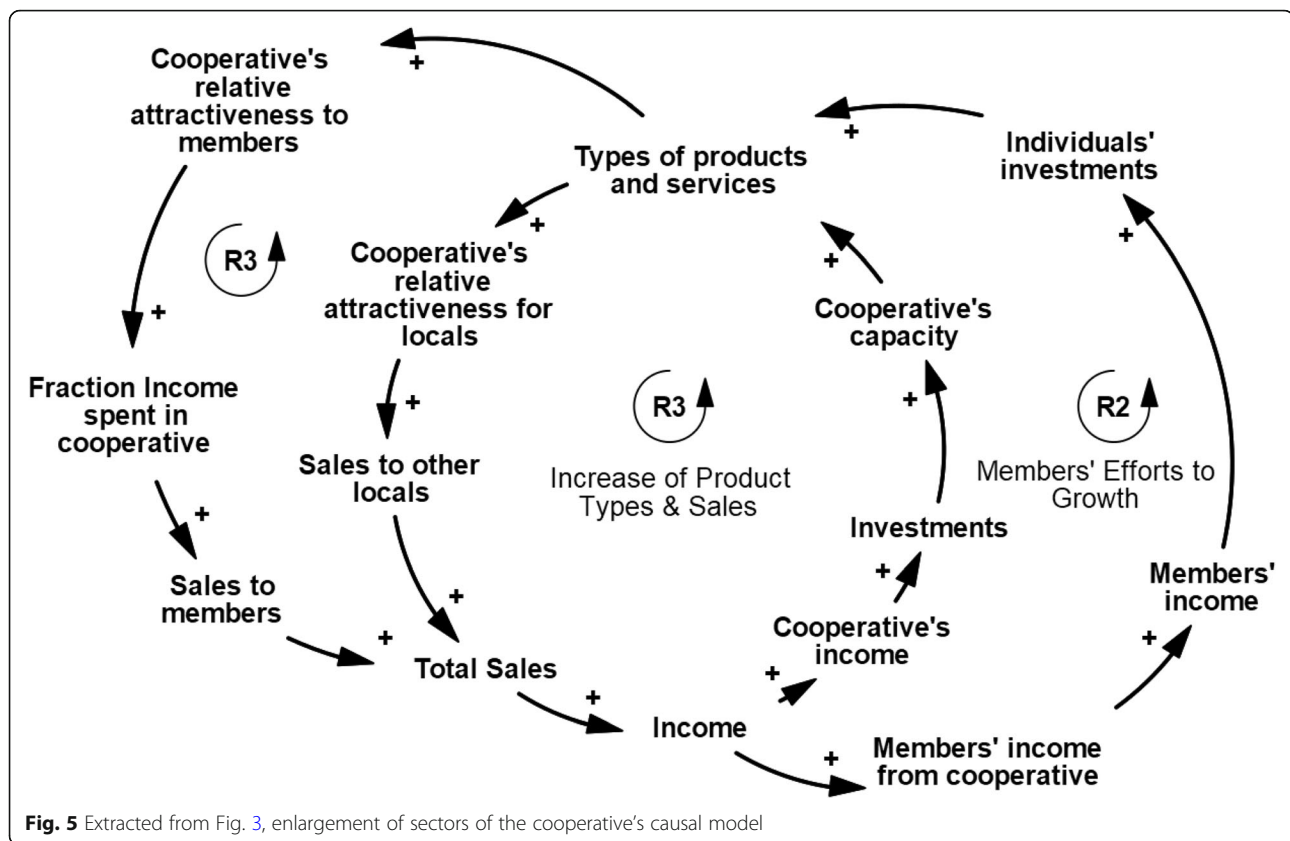


last is compared with the actual *members' income* and, if a gap exists, members will put effort into the cooperative growth. However, as this gap progressively closes, members will be satisfied with their condition and do not put effort into expanding the cooperative sales further, as it occurs in the regular business where they keep pursuing higher and higher affluence levels. In the long term, the degrowth cooperative is expected to distinguish itself from other economic organisations and cooperatives through such specific dynamics, defining its ethos.

Synergy between PSDM and degrowth/cooperativism

Overall, the PSDM intervention can be considered sufficiently positive. Besides capturing the complex cause-effect structure behind the functioning of a degrowth cooperative, the manager and members reported positive feedback on the method and that it impacted the organisation and members on several levels. To the authors, it

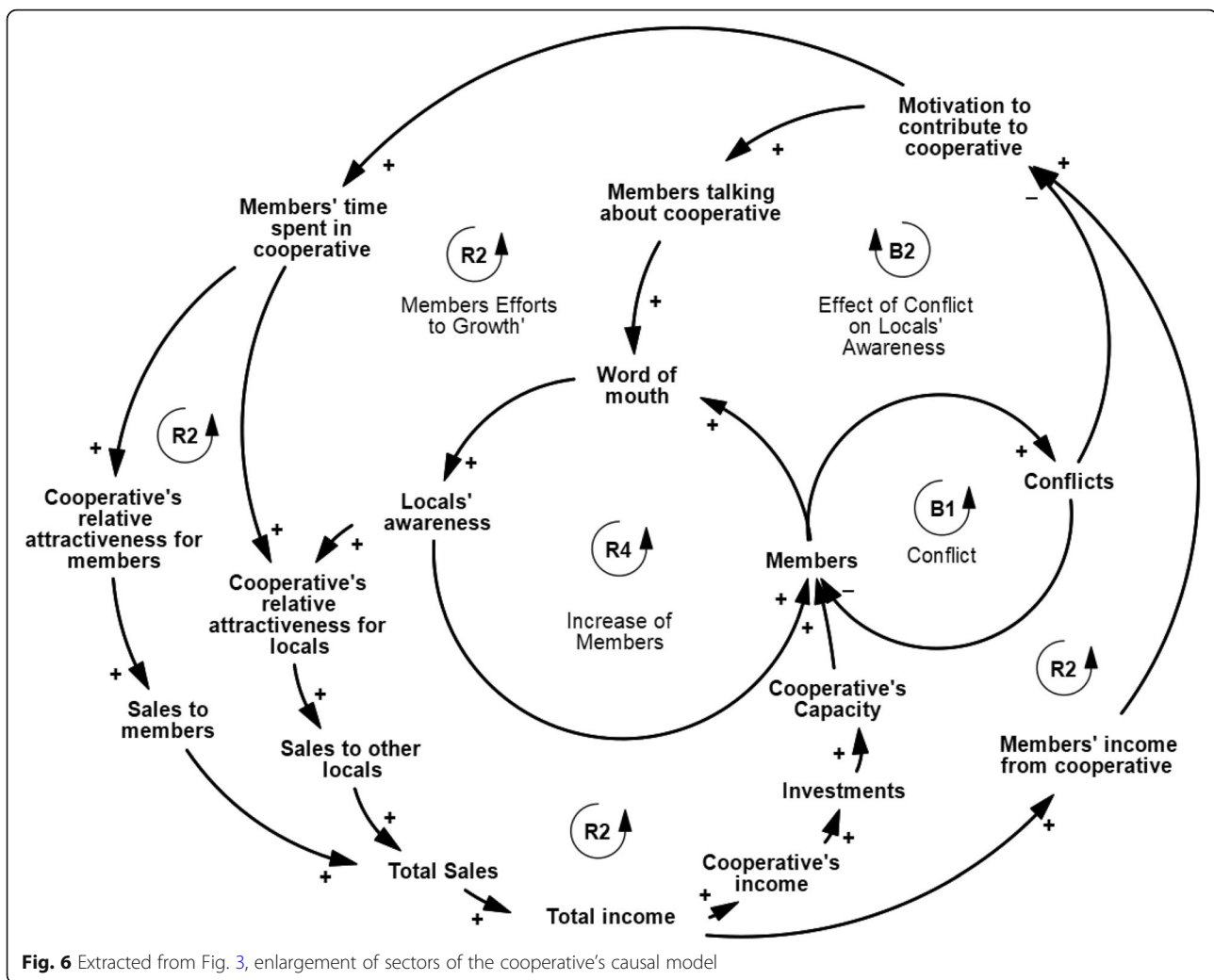
appears worth noticing the easiness through which the project was conducted in the organisation, which is not always like that (e.g. Gerrits and Vaandrager, 2017). In about 2 months, the intervention was conducted. On top of that, carrying out the interviews and the session has been notably smooth to do. Participants adapted to and got engaged in the PSDM approach quite 'naturally'. The reason could be identified in the shared values among PSDM and degrowth-cooperatives (i.e. the importance of people participating in the governance and decision-making). Members are used to being involved in participatory decision-making processes and introducing them to a participatory approach was not challenging. This time the difference from their usual meetings was that discussion was facilitated and structured with the use of causal models and, according to the results, it seems that it added some value since it helped them to identify leverage items, increase participants' commitment to common solutions and change their behaviour



towards the organisation. Overall, we did not see any sign of resistance to PSDM, and, given the feedback received, the project seemed to be useful. Thus, we hypothesise that the specific organisational culture made the integration of PSDM method in the organisation's decision-making process particularly easy. Thus, the project could be seen as the first proof that theoretical synergies between degrowth, cooperativism, and PSDM exist and that these synergies could be employed by using PSDM to support organisations like Segredo. Looking even further, it could be speculated that, in the future, PSDM could become a daily tool for cooperatives (in particular degrowth cooperatives) and integrated in their traditional decision-making process when they need to deal with complex dynamic problems.

Figure 8 illustrates our perspective on how PSDM could support the development of degrowth-cooperativism. Through promotion, there will be more people participating in the initiative. With more people involved, there will be a higher level of complexity to deal with, which can reduce the effectiveness of the decision-making process. If the effectiveness of the decision-making process decreases, the members' commitment and engagement in the organisation could be

reduced, as they perceive the cooperative's decisions to be inadequate, whereby its operations become to rely more on the manager. A decrease in members' commitment, and thereby activities, erodes the cooperative's purpose and its ethos, and pushes managers to take more responsibilities. This can, in turn, further decrease the general participation in the decision process. Over time the cooperative could be trapped in this undesired reinforcing feedback: the vicious cycle portrayed with the R symbol in Fig. 8. This can also be seen from the opposite perspective: more members lead to more participants to the decision-making process, which enhances the process effectiveness through providing more information for decision making. In turn, high members' commitment decreases the necessity to rely on the manager, further stimulating participation as members appreciate that their involvement impacts the cooperative decisions. Thus, if 'pushed' in the other direction, the same loop can be virtuous since it promotes participation and cooperativism and fosters the organisation's ethos. Given the positive effects of PSDM on participation, decision effectiveness and commitment, it could significantly contribute to steering this loop towards the more desirable direction.



In general, common participatory approaches such as facilitation (Schuman, 2005) may not be able to provide sufficient support in the stakeholder engagement process. Both degrowth and cooperative movements operate in the context of a complex system. Given the human limited mental capacities, it is almost impossible for any single stakeholder to grasp the complexity and its long-term effects (Stermann, 2000). PSDM is explicitly developed in response to the need for involving multiple stakeholders and addressing the issues' complexity. According to Stave (2010), it is an approach of engaging stakeholders in the process of decision analysis where quantitative or qualitative models are constructed and used to support decision-making (Franco and Montibeller, 2010; Franco and Rouwette, 2011). The visual layout of system dynamics can provide a relatively user-friendly representation of complex issues.

However, PSDM is not the only existing facilitated modelling method to analyse complexity. In Segredo's case, PSDM was evaluated as the most suitable tool since the problem to deal with was relatively clear. Segredo's previous efforts to improve the situation was perceived as ineffective, and the organisation was looking for directions to guide their strategies. The main desire of the cooperative was to improve their understanding of how the system worked. Suppose the problem was unclear, or there was no consensus about it, problem structuring methods, like soft systems methodology (Checkland and Tsouvalis, 1997) or fuzzy cognitive maps (Kosko, 1986), could have been more suitable for the task. If the organisation was seeking precise policy suggestions (e.g. numerical indication about investments), qualitative PSDM would not have fulfilled the scope and could have been followed by a quantification phase involving stakeholders. Alternatively, if the necessity of the

cooperative was to understand the complexity of individual behaviour, or collect specific spatial insights, participatory agent-based modelling (Ramanath and Gilber, 2004) or participatory geographical information systems (Dunn, 2007) could have been more appropriate. Therefore, the reader should not fall into the trap of considering PSDM as the best or only facilitated modelling method but must decide which approach to use based on the cooperative's necessity and context.

This work contributes to the debate on the cooperatives' tools and mechanisms for governance and conflict resolution (Brummer et al., 2017; Giglio et al., 2020). First, PSDM offers an approach to enhance the effectiveness of the decision-making process. Second, PSDM can facilitate members' participation in the decision-making process by involving all stakeholders in different stages (Stave, 2010; Vennix, 1996). On top of that, SD tools stress clarity and transparency to be important and useful principles for engaging stakeholders (Scott et al., 2016). This may lead to a higher number of participants in the decision-making meetings among the cooperative's members because they can feel the usefulness of attending. Third, it can increase members' commitment towards the decision taken (Scott et al., 2016). PSDM has proven to be an effective way to tackle problems collectively since it generates a high degree of ownership of the problem and increases motivation to change (Scott et al., 2016; Stave, 2010; Vennix, 1996). Finally, all the listed points potentially are valuable also for other facilitated modelling approaches (although further research on this is necessary).

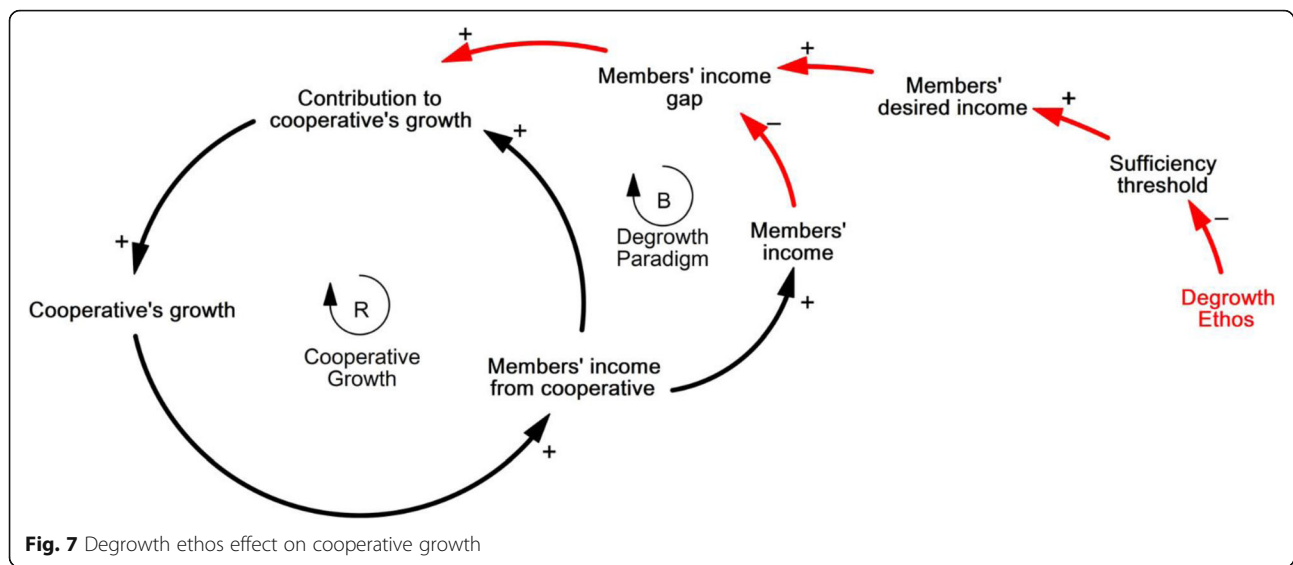
Generalisation and limitations

The project provides interesting insights into the internal dynamics that a cooperative practising degrowth faces, particularly at its early stages. It also highlights the issues that a cooperative such as Segredo needs to overcome and what possible leverages it can use to stimulate the desired dynamics in the system. The solutions that emerged here could provide help or insights for similar organisations facing similar issues. Overall, PSDM provided a high-level overview of the causal relationships in the cooperative's functioning. While it may help to comprehend and handle organisational complexity, it might overlook more granular aspects (e.g. members' behaviour). In this respect, other methods like direct observations, archival investigation, or agent-based modelling could provide more nuanced and detailed insights into the cooperative's 'micro' aspects.

As in most case studies, limitations regarding the generalisation of the insights exist. It could be that, for some unknown reasons, Segredo was a very fertile organisation to test the effectiveness of PSDM in degrowth

cooperativism and that it would work differently in other contexts. Although this eventuality cannot be excluded, the probability of this happening does not appear to be high since Segredo represents the prototype of the cooperative practising degrowth. For these reasons, the insights gained on degrowth cooperative functioning should be handled carefully. They emerge from a single case; thus, they should be considered just as a first attempt to describe how degrowth cooperatives operate and the challenges they may tend to face. Generalisation could only occur after more extensive research. From this perspective, our work is also expected to help future research by providing expectations on what dynamics could be found in this type of organisation.

Similar considerations can be made concerning the generalisation of the method and its suitability for degrowth cooperativism. In particular, the evaluation of the positive impact of the PSDM process was limited to the cooperative feedback and the manager reporting behavioural change among members, which, although relevant, cannot be considered systematic evidence. Moreover, what should also be taken into account is that the project was relatively 'light': only interviews and a workshop took place. It could be that this light PSDM structure influenced the results, and that with 'heavier' projects the results could have been different (for example, a greater time investment from the members for the project could have discouraged them from participating). In addition, it requires the organisation to develop specific facilitation and modelling skills; otherwise, it might depend on external experts, which could be seen as an undesired burden or restriction. Therefore, if degrowth cooperatives desire to introduce facilitated modelling methods as part of their governance, it could be that approaches like qualitative PSDM or soft system methodologies are more appealing, as the necessary abilities to execute them are simpler to master. In contrast, quantified methods (e.g. quantified PSDM and participatory agent-based modelling) could be found harder to integrate as these require extensive mathematical and coding skills. At the same time, facilitated modelling support works well with groups of approximately 15–20 people (Vennix, 1996), which could make it necessary for larger cooperatives, with more participants to decisional-meetings, to have more than one facilitator, or to split the meetings into multiple sessions. Nonetheless, with the available information, we believe that the synergies between PSDM, other participatory modelling methods (Franco and Montibeller, 2010; Franco and Rouwette, 2011), cooperativism and degrowth exist, and are worth being further explored.

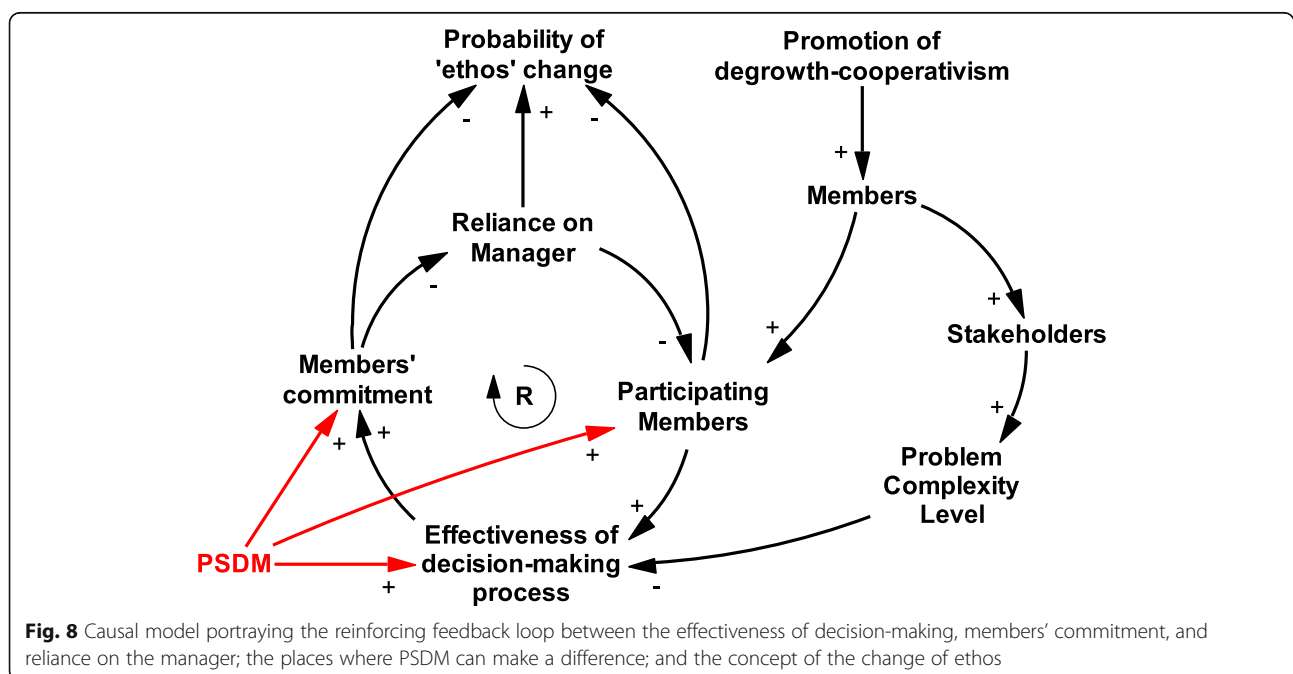


Finally, we do not see any drawback in generalising the insights on the dynamics identified for degrowth cooperatives and the synergies that emerged with the PSDM method to the other organisations and forms of activism that apply and practice degrowth (e.g. ecovillages, cohousing, specific communities). Similar challenges can be identified among these organisations (e.g. maintaining the ethos, conflict insurgence, reaching the desired self-sufficiency, workload management, members involvement, and increase), making some of the reflections elaborated in this manuscript potentially relevant and helpful for those

cases. Moreover, similar to cooperativism, degrowth promotes democratic and participative forms of governance, making the considerations developed on the usefulness and suitability of participatory modelling and facilitation useful for other degrowth experiences.

Conclusion and further research

In correspondence with the sprouting of degrowth practices, the attention on the movement increased over the last years. However, the internal and organisational dynamics of a cooperative practising degrowth were not



yet studied. This research attempted to fill this gap through a case study setting, in which the PSDM approach was adopted to map the cause-effect relations within the Segredo degrowth cooperative. This work resulted in the development of a causal model based on interviews and a workshop with the manager and committed members of Segredo. The causal model provides an overall perspective of the workings of a cooperative within the local community, and it served as inspiration for actions that can affect Segredo's future development and possibly of other local cooperatives and activists putting into practice degrowth cooperativism. In the initial phases of newly born degrowth cooperatives, attention should be paid to the reinforcing dynamics leading to economic and social growth. If it does not reach a specific size, it may not be entirely sustainable in the long term. After that, balancing mechanisms limiting its growth are expected to play a significant role. The possibility of the emergence of conflicts among members increases proportionally to their number and heterogeneity (Sebhatu et al., 2020; Slade Shantz et al., 2020) and should be carefully taken under observation as the cooperative grows. However, of particular interest are the two degrowth-specific dynamics that are expected to distinguish degrowth cooperatives from other businesses in the long term. First, the local focus of the initiative restricts the members and customer bases, thus limiting the expansion of the cooperative. Secondly, Segredo's members expected that, once the cooperative is economically viable, the principles of degrowth will support them in identifying a sufficient level of income. Reaching this desired level will then decrease the effort they put into cooperative growth, slowing it down. These last two mechanisms should impede the cooperative excessive growth and detachment from degrowth principles (Johanisova et al., 2013, 2014).

During the two months project, according to the manager's feedback, the project did succeed in increasing the cooperative awareness among the members participating in the workshop, collecting ideas for communicating the causal model to other members and facilitating them to come up with future action items. In addition, the intervention directly influenced the participants' behaviour towards the cooperative (e.g., some of them spent more time in the organisation). Interestingly, in this respect, the PSDM method appeared to fit particularly well in the context. However, no study was conducted yet exploring the suitability and effectiveness of PSDM in real organisations practising degrowth. Given the similar values of democratisation, participation, people engagement, and empowerment shared by facilitated modelling approaches and cooperativism/degrowth, and the 'messiness' and complexity

intrinsically involved in cooperatives' contexts, facilitated modelling approaches like PSDM appear to be very suited for dealing with problems emerging not only in degrowth cooperatives but also in other degrowth experiences. In these cases, unstructured traditional meetings become less useful when dealing with messy issues, members' participation decreases, and then managers or leaders need to take over more power and responsibilities to carry on the organisation with the risk of decreasing the member commitment towards the organisation's goals. That is where the PSDM approach can support local cooperatives' decision-making procedures in practice, supporting them in dealing with the complex issues they inevitably face due to their nature and therefore help their diffusion and sustainability. In addition, PSDM could be integrated into the decision-making procedure and become a tool they systematically use when needed (Brummer et al., 2017; Giglio et al., 2020). For example, organising a workshop explaining the basics of feedback loops and introducing the causal model could be the basis for facilitating shared understanding among cooperatives' members, or some causal relations identified in this case study could be used as a starting point for future analysis, models or workshops in other cases. Thus, despite the evidence limited to a single case study and the limitations of the evidence collected, we argue that PSDM could be introduced and used with ease in cooperatives and that it has the potential to significantly support degrowth movements.

However, as mentioned in the "Discussion and analysis" section, this was 'only' a case study. Thus, future efforts should be directed towards two specific directions to confirm or disconfirm the findings gained through this study. First, concerning the content, other case studies should be carried out within degrowth cooperativism to explore the functioning of these organisations. For example, the insights gained in this project may not be the same in other contexts due to cultural and social specifics. Once enough data is collected, systematic studies could be performed to develop more robust models and frameworks explaining degrowth cooperatives' operational functioning and challenges. Additionally, it would be interesting to expand the system's boundaries from a single cooperative to the local economic system to conduct quantitative studies on how degrowth cooperatives can contribute to the prosperity of a local community. In other words, while this study explored the internal processes of a degrowth cooperative, future research should focus on their external dynamics, namely how those organisations integrate within the local environment, how they achieve their objectives of local sustainability and what non-members think of them. Moreover, this type of

SD causal models of cooperatives, suitable for analysing dynamics unfolding over time, could be quantified and used to test theories of cooperative cycles and development (e.g. Cook, 2018) through simulation. Second, in respect of the method, more research is also needed for increasing the robustness of facilitated modelling and PSDM approaches in these environments. For example, comparative studies between organisations decision-making processes with and without facilitated modelling interventions could improve our understanding of the methodology's impact in these contexts. Similarly, testing the same participatory method in different degrowth cooperatives could highlight the degree to which these insights are context-dependent or could be generalised. Moreover, more sophisticated evaluation methods of the impact of PSDM and participatory modelling techniques on cooperative decision-making should be embedded in those tests.

In conclusion, local cooperativism is one of the main political means by which degrowth activists can achieve their goals (Johanisova et al., 2013, 2014) and attempt to create what they believe to be a more sustainable society and environment. Mills and Davies (2013) reason that cooperatives have the potential to alleviate global sustainability issues. They state that it is important not just to raise people's awareness of the benefits and challenges of these organisations, but also to provide local cooperatives with tools and other forms of support to reduce the barriers that hinder their progress. The work developed in this study contributes to that.

Appendix 1

Interview structure

Interview questions

- Self-introduction
- Purposes of Interview
 - To collect points of view about the cooperative
- Notice
 - Confidentiality
 - It is fine not to answer if it is uncomfortable
- History and Background
 - When and how did the interviewee join the cooperative?
 - (What were your reasons for joining?)
- Current operation of the system/flow of currency
 - What is the purpose of the cooperative?
 - How does the cooperative work currently?
 - What is the contribution of the cooperative to your business/income?
 - What is the percentage of income coming from the cooperative?
 - Do you spend your income in the cooperative? About what amount?

- On what products?
- What is your consideration for buying stuff from the cooperative?
- Interpersonal interaction
 - Do you know other members in the cooperative? (familiarity)
 - How often do you meet? For what reasons (ex: discussion on cooperative, chatting)? (Interaction frequency and purpose)
 - How are decisions made in the cooperative?
 - Relationship and atmosphere
 - How do you feel during the meeting?
 - How do you think about other members in the cooperative?
- Envision the future
 - What do you hope to see in the cooperative if everything goes well?
 - (If you can choose to change one thing in the cooperative, what would you choose? (Question of the magic stick))
- What are the (tangible and intangible) challenges for reaching vision?
- What change does the cooperative need to reach the vision?
- Introducing the workshop
 - Building common understanding: How do we all think the way it works?
 - Different people might have different perspectives. We try to show these different views on one map. (Maybe someone else needs your perspective as well?)
 - (How can we improve interaction/communication during the workshop?)
 - Invitation through Manager
- Is there anything I should know about the cooperative but that I did not ask?

Do you have any questions for me?

Appendix 2

Workshop procedure

- Duration: 3–4 h
- Overall objectives
 - To revise the systems map of Segredo
 - To collect ideas about how to communicate the systems map to the rest of the members in Segredo
 - To discuss the potential points to intervene the system and the potential action items (optional)
- Number of participants: 5–10
- Procedure

Table A1. Workshop procedure

Session	Objective	Description	Material
Opening (5 min)	- To introduce the objectives and the agenda of the workshop. - To get the participants prepared for the workshop. - To introduce the workshop team.	- "Recently we are working on a project about Segredo. And the purpose of the project is to create a system map for Segredo so as to let you know how the cooperative is operating. - "In the previous interview with you, we collected your viewpoints about Segredo and create a first draft of systems map. - "So, the purposes of today's workshop are to ask for your feedback and revise the systems map. - "Besides, because the systems map will also be introduced to other members in the cooperative in the future, we would also like to collect your feedback on how to communicate the systems map to the other members."	- Presentation slide - Post-its - Markers - Parking lot (separate flipchart paper on the wall to put post-it's with questions to be answered later)
Systems Map Introduction (35 min)	- To introduce the concept of CLD to the participants. - To introduce the systems map.	- Introduce the CLD language to the participants (variables, arrows, polarities and loops) "The systems map is composed of two parts: variables, arrows. "The arrows represent the cause-and-effect relationship between variables. An arrow starts from a cause and point to the effect. If a 'effect variable' increases as its 'cause variable' increases, then we will give the arrow a '+' sign; if the effect variable decreases as the cause variable increases, then we will put a '-' sign. "When an arrow links the effect back to its cause, then it will create a feedback loop. There are two types of loops. A reinforcing feedback loop makes the variables in the loop keep increasing or decreasing, and a balancing feedback loop tend to maintain the variables at certain values." - Simple examples prepared: savings and interest rate, population growth, chicken-egg and road crossings - Introduce the system map - Sectors of the systems map - Major variables - Major feedback loop	- Slide
Systems Map Revision (110 min)	- To facilitate reflection on the systems map. - To facilitate the participants to revise the systems map. - To have discussion on potential points to intervene the system and the potential action items (optional).	- Introduction "Next we would like to ask for your feedback on the Segredo's map." - Round #1 (15 min.) - Focused questions: "Which part of the systems map is unclear?" "Which part of the systems map is new for me about Segredo?" - Format: - Pair discussion (A4 paper, marker) - Plenary discussion + recorder put down the note (flipchart paper, marker) - Instructions: - Please find another partner (1 or 2) to form a group - Use 7 min. to discuss the following questions: - Which part of systems map is unclear? - Which part of the systems map is new for me about Segredo? - After pair discussion is finished: "I would like to ask each group to share your discussion. Let's start from the first question and start from this group (designate a group)". - Round #2 (20 min.) - Focused questions: - What is my learning about Segredo from the system map? - Internal & external	- Questions on slide - A4 systems map*10 - A1 systems map *1 - A4 paper*10 - Markers - Flipchart paper*6 - Dots, - Post-it's

Table A1. Workshop procedure (Continued)

Session	Objective	Description	Material
		• Current reality • Future opportunity and challenge? Format: ▪ Pair discussion (A4 paper, marker) ▪ Plenary discussion + recorder put down the note (flipchart paper, marker) Instructions: ▪ Please find a new partner (1 or 2) to form a group ▪ Use 10 min. to discuss the following questions: • What is my insight from the system map? Discuss on 1) the current reality, and 2) future opportunities and challenges. ▪ After pair discussion is finished: "I would like to ask each group to share your discussion. Which group wants to start first?" - Round #3 (25 min.) Focused questions: ▪ What are my suggestions for revising the system map? (add/change variables/arrows) Format: ▪ Pair discussion (A4 paper, marker) ▪ Plenary discussion + recorder put down the note (flipchart paper, marker) Instructions: ▪ "Please find a new partner (1 or 2) to form a group. Use 15 min. to discuss the following questions: • What are my suggestions for revising the system map? • The suggestions might be changing change the variables in the map or add a new variable. • The suggestions could also be changing the arrows/connection between variables. • If you think one part of the map should be revised but you don't know how to revise, you can also share your ideas, and someone might know how to put your ideas into the map." ▪ After pair discussion is finished: "I would like to ask each group to share your discussion. Which group wants to start first?" - Revising the map (50 min.) "In the next 40 min., we would like to ask you to revise the Segredo's map. You can use your marker to revise the map. If you have other comments on the map, you can write on the post-it note. During the revision, you may ask me or the other facilitators for help." - Group review on the changes (10 min). After revision: "Please introduce what you have revised on the map." Note: Depending on the flow of discussion, the participants may start to discuss the solutions to their problems. If it happens and time allows, we can facilitate an additional round of discussion for the participants to discuss the points for intervention and possible action items: Focused questions ▪ According to the systems map, what are the potential points we could act on to improve the system? What are the corresponding action items for these points? Format: ▪ Dot voting ▪ Post-it notes	

Table A1. Workshop procedure (Continued)

Session	Objective	Description	Material
Ideas For Communication (20 min)	- To collect ideas for communicating the systems map.	- Introduction “Next we would like to have your suggestions about how to introduce the systems map to other Segredo’s members - Key points to share (15 min.) - Focused question: ▪ If we are going to introduce the systems map to the other members, what are the key points to share? - Format: ▪ Dot voting (Dots, post-it, marker) ▪ Plenary discussion - Instructions: ▪ Please put dots on the items in the flipchart that you would like to share with other members ▪ If you have other opinions, you can write on the post-it notes and put on the flipchart ▪ (After putting dots & post-it) Let’s see the flipchart together. Which items have more dots? - (Right after reviewing the dots and post-it notes) - Suggestions on helping other members understand the map (3 min) - Focused question: ▪ To help other members to understand the system map more easily what is my suggestion? - Format: ▪ Popcorn + recorder put down the note (flipchart paper, marker) - Instructions: ▪ To help other members to understand the system map more easily: what is your suggestion?	- Slide - Dots*100 (10 dots/person) - Post-it - Marker - Flipchart*2
Closing circle (10 min)	- Closing & reflection	- “Before the end of the workshop, I would like to ask you to say anything you want to say to close the workshop. - “You may share your feeling, insights, or any comments.”	- Closing slide - Contact details (cards)

Appendix 3

Voting results

Table A2. Voting results

Variables	Votes
Segredo's investment	●●2
Fixed cost	●1
Segredo's relative attractiveness to locals	●●●3
Competitors' campaign	●●2
Local awareness	●●●●●●●●●●●13
Local promotion	●●2
Marketing strategy	●●●●●●●●●●10
staff demand	●●●3
Members' income from Segredo	●●●3
Motivation to spend time in Segredo	●●●●●●●8
production cost	●●●●4
Willingness to spend money in Segredo	●●2
Segredo's relative attractiveness to members	●●●3
Percentage of members talking about Segredo	●●●3
Word of mouth	●●2
Sales to members	●1

Appendix 4

Policies suggested

Based on the researchers' learning about Segredo, several strategies were suggested. To efficiently utilise the limited time and resources in implementation, the strategies are labelled based on their catalytic, urgent, and symbolic attributes (labelled through the researchers' subjective judgment).

- *Catalytic*: if the implementation of a strategy can facilitate the implementation of other strategies, then it is “catalytic” and hence may need to be implemented earlier than other strategies.

- *Urgent*: if a strategy needs to be implemented as soon as possible, it is “urgent.”
- *Symbolic*: if a strategy's implementation can easily let people know they are making progress, then it is “symbolic”.

A strategy may have more than one attribute, and in this case, that strategy has a higher priority. Next to these attributes, the strategies are also grouped on time-horizons of short, mid and long term (up to 6 months, 6 months to 3 years, and 3 years and longer)

Table A3. Suggested policies

Time horizon	Policy	Action	Type
Short-term (upcoming 6 months)	Increase cooperative awareness	The action items supporting this strategy include introducing the systems map to all the members of Segredo, asking them for feedback and revisions on the systems map, discussing what to do next, and taking the strategies suggested by the researchers as reference.	Urgent, catalytic
	Raise the local awareness and the relative attractiveness of Segredo	Several actions could help to implement this strategy, such as developing a marketing plan and engaging members in the promotion. Another implicit action could be encouraging members to spend more time within the cooperative in order to make locals more familiar with Segredo and alleviate staff's workload, allowing them to have more time for promotion.	Urgent
	Facilitate the sharing of production cost	This can be done through establishing a collaboration platform, in which members can easily post what they need and what they can offer to the other members; and through creating a list of Segredo's equipment that can be lent to the members so that they know what is possible to borrow from the cooperative.	Catalytic
	Create regular occasions for communication and make Segredo look more formal	The cooperative could release regular reports or newsletters to let the members know the progress of Segredo and increase their sense of participation. In addition, the cooperative could hold regular gatherings for members to interact with each other in order to strengthen their relationships. Furthermore, to secure engagement on a voluntary basis, it may be nice to provide some incentive to encourage the members to attend the meetings, such as taking part of the cooperative's income to provide free food in the gathering.	Symbolic
Mid-term (6 months to 3 years)	Put effort in recruiting more members	A systems map from the perspective of individuals can be used to explain how the cooperative could contribute to the business of potential members to recruit more people.	Urgent
	Make Segredo able to operate autonomously and decrease its dependence on the manager	Actions that might be needed to support this strategy include offering training in management to the members and helping them understand that the cooperative's sustainable prosperity depends on their participation in managing Segredo.	Catalytic
	Create a mechanism for constructive conflict resolution	The purpose of this strategy is to respond constructively to potential conflicts when there are more and more members in the future	Catalytic
Long-term (3 years and longer)	Deepen members' understanding of “degrowth” and Segredo's influence on the local economy	After members' economic necessity is met, it is important to deepen their understanding of the long-term impact of the cooperative on the community, as the indefinite growth of Segredo might contradict the core values of cooperativism and degrowth. Hence, it would be important to improve members' systems understanding so as to facilitate them to make conscious choices for their future development	Symbolic, catalytic

Acknowledgements

We would like to express our gratitude to Nuno Videira, who connected us with Segredo and helped us during the process. Also, we would like to thank Paula Antunes, Rui Ferreira dos Santos, and Krystyna Stave for their additional feedback. Special thanks should be given to Segredo's manager for all the support he provided us. Also, we would like to thank Josephine Musango for her comments on early versions of the causal diagrams, and I-Chun Huang for correcting flaws in them based on a quantified model. Last but not least, we are very grateful for the collaboration with the members of Segredo. They have been responsible for the project's success and many lovely moments. Special thanks to all the reviewers, who made this work more readable and substantial. All the mistakes are ours.

Authors' contributions

All authors read and approved the final manuscript.

Declarations

Competing interests

The authors declare that they have no competing interests.

Author details

¹Business School, University of New South Wales, Sydney, NSW 2052, Australia. ²TNO, The Netherlands Organization for Applied Scientific Research, Anna van Buerenplein 1, 2595, DA, The Hague, The Netherlands. ³Open Quest Facilitation Technology, 6F-1, No. 72, Xinyi Road Section 2, Daan District, Taipei City R.O.C, Taiwan.

Received: 4 January 2022 Accepted: 19 April 2022

Published online: 12 June 2022

References

- Andersen DF, Richardson GP (1997) Scripts for group model building. *Syst Dynamics Rev* 13(2):107–129. [https://doi.org/10.1002/\(SICI\)1099-1727\(199722\)13:2<107:A-ID-SDR120>3.0.CO;2-7](https://doi.org/10.1002/(SICI)1099-1727(199722)13:2<107:A-ID-SDR120>3.0.CO;2-7).
- Ariès, P. (2005). *Manifeste pour une décroissance équitable*. (Edition Golias, Ed.). Villeurbanne.
- Asara V, Profumi E, Kallis G (2013) Degrowth, democracy and autonomy. *Environmental Values*. <https://doi.org/10.3197/096327113X13581561725239>
- Balaguer Rasillo X (2021) Alternative economies, digital innovation and commoning in grassroots organisations: Analysing degrowth currencies in the Spanish region of Catalonia. *Environ Policy Governance* 31(3):175–185. <https://doi.org/10.1002/eet.1910>
- Balestra C, Tonkin R (2018) Inequalities in household wealth across OECD countries: Evidence from the OECD Wealth Distribution Database (No. 2018/01). OECD Statistics Working Papers, Paris. <https://doi.org/10.1787/7e1bf673-en>
- Bartolini S, Bilancini E, Pugno M (2013) Did the Decline in Social Connections Depress Americans' Happiness? *Soc Indicators Res* 110(3):1033–1059. <https://doi.org/10.1007/s11205-011-9971-x>
- Beckage B, Gross LJ, Lacasse K, Carr E, Metcalf SS, Winter JM et al (2018) Linking models of human behaviour and climate alters projected climate change. *Nature Climate Change* 8(1):79–84. <https://doi.org/10.1038/s41558-017-0031-7>
- Bennich, T., Bongers, T., & Collste, D. (2015). Exploring degrowth pathways using system dynamics. In 33rd International Conference of the System Dynamics Society (pp. 1–28). Cambridge, Massachussets, USA.
- van den Bergh JCM (2009) The GDP paradox. *J Econ Psychol* 30(2):117–135. <https://doi.org/10.1016/j.joep.2008.12.001>
- Boillat S, Gerber JF, Funes-Monzote FR (2012) What economic democracy for degrowth? Some comments on the contribution of socialist models and Cuban agroecology. *Futures* 44(6):600–607. <https://doi.org/10.1016/j.futures.2012.03.021>
- Bradbury, H. (2015). *The SAGE Handbook of Action Research*. 1 Oliver's Yard, 55 City Road London EC1Y 1SP: SAGE Publications Ltd. <https://doi.org/10.4135/9781473921290>
- Bradshaw CJA, Ehrlich PR, Beattie A, Ceballos G, Crist E, Diamond J et al (2021) Underestimating the challenges of avoiding a ghastly future. *Front Conserv Sci* 1(January):1–10. <https://doi.org/10.3389/fcsc.2020.615419>
- Brossmann J, Islar M (2020) Living degrowth? Investigating degrowth practices through performative methods. *Sustainability Science* 15(3):917–930. <https://doi.org/10.1007/s11625-019-00756-y>
- Brummer V, Herbes C, Gericke N (2017) Conflict handling in renewable energy cooperatives (RECs): Organizational effects and member well-being. *Ann Public Coop Econ* 88(2):179–202. <https://doi.org/10.1111/apce.12159>
- Brundtland GH (1987) Our Common Future. <https://doi.org/10.2307/633499>
- Buhr K, Isaksson K, Hagbert P (2018) Local interpretations of degrowth-actors, arenas and attempts to influence policy. *Sustainability (Switzerland)* 10(6):1–14. <https://doi.org/10.3390/su10061899>
- Cattaneo, C., & Gavalda, M. (2010). The experience of urban squats in Collserola, Barcelona: what kind of degrowth? *J Cleaner Produc*, 18(6), 581–589. <https://doi.org/10.1016/j.jclepro.2010.01.010>
- Checkland P, Tsouvalis C (1997) Reflecting on SSM The Link Between Root Definitions and Conceptual Models. *Syst Res Behav Sci* 14(3):153–168. [https://doi.org/10.1002/\(SICI\)1099-1743\(199705/06\)14:3%3C153::AID-SRES134%3E3.0.CO;2-H>abstract](https://doi.org/10.1002/(SICI)1099-1743(199705/06)14:3%3C153::AID-SRES134%3E3.0.CO;2-H>abstract)
- Chiangkul, P. (2018). The degrowth movement: alternative economic practices and relevance to developing countries. *Alternatives*, 43(2), 81–95. <https://doi.org/10.1177/0304375418811763>
- Cook, M. L. (2018). A life cycle explanation of cooperative longevity. *Sustainability*, 10(5). <https://doi.org/10.3390/su10051586>
- Costanza R, Kubiszewski I, Giovannini E, Lovins H, McGlade J, Pickett KE et al (2014) Time to leave GDP behind. *Nature* 505(7483):283–285 Retrieved from <http://www.nature.com/news/development-time-to-leave-gdp-behind-1.14499>
- D'Alessandro S, Cieplinski A, Distefano T, Dittmer K (2020) Feasible alternatives to green growth. *Nat Sustainability* 3(4):329–335. <https://doi.org/10.1038/s41893-020-0484-y>
- D'Alisa, G., & Kallis, G. (2020). Degrowth and the State. *Ecolo Econ*, 169(September 2019), 106486. <https://doi.org/10.1016/j.ecolecon.2019.106486>
- D'Alisa G, Demaria F, Kallis G (2014) Degrowth: A Vocabulary for a New Era. Routledge
- Datta PB, Gailey R (2012) Empowering women through social entrepreneurship: case study of a women's cooperative in India. *Entrep Theory Practice* 36(3): 569–587. <https://doi.org/10.1111/j.1540-6520.2012.00505.x>
- Demaria F, Schneider F, Sekulova F, Martinez-Alier J (2013) What is degrowth? From an activist slogan to a social movement. *Environmental Values* 22(2): 191–215. <https://doi.org/10.3197/096327113X13581561725194>
- Demaria F, Kallis G, Bakker K (2019) Geographies of degrowth: Nowtopias, resurgences and the decolonization of imaginaries and places. *Environ Plann E: Nature and Space* 2(3):431–450. <https://doi.org/10.1177/2514848619869689>
- Denscombe M (2012) Research proposals: a practical guide: a practical guide. McGraw-Hill Education (UK)
- Dombi J (2015) Sustainable consumption in the de-growth transition the case of local foods. In: Hetesi E, Vas Z (eds) *New Ideas in a Changing World of Business Management and Marketing*. University of Szeged, Szeged, pp 109–123 Retrieved from <http://eco.u-szeged.hu/download.php?docID=46209>
- Đula I, Videira N, Größler A (2019) Degrowth dynamics: modelling policy proposals with system dynamics. *J Simulation* 1–37. <https://doi.org/10.1080/17477778.2019.1646108>
- Dunn CE (2007) Participatory GIS — a people's GIS? Progress in Human Geography 31(5):616–637. <https://doi.org/10.1177/0309132507081493>
- Ford, A. (2009). *Modeling the Environment* (2nd ed.). Island Press.
- Forrester J (1961) *Industrial Dynamics*. Massachusetts Institute of Technology Press
- Franco LA, Montibeller G (2010) Facilitated modelling in operational research. *Euro J Operational Res* 205(3):489–500. <https://doi.org/10.1016/j.ejor.2009.09.030>
- Franco LA, Rouwette EAJA (2011) Decision development in facilitated modelling workshops. *Euro J Operational Res* 212(1):164–178. <https://doi.org/10.1016/j.ejor.2011.01.039>
- Gerrits L, Vaandrager D (2017) Group model building in a pressure cooker: a field experiment with public policy. *Syst Res Behav Sci*. <https://doi.org/10.1002/sres.2446>
- Giglio EM, Ryngeblum A, de Sousa L, Jabbar AB (2020) Relational governance in recycling cooperatives: A proposal for managing tensions in sustainability. *J Cleaner Produc* 260:121036. <https://doi.org/10.1016/j.jclepro.2020.121036>
- Göler von Ravensburg, N. (2011). Economic and other benefits of the entrepreneurs' cooperative as a specific form of enterprise cluster.
- Görg, C., Plank, C., Wiedenhofer, D., Mayer, A., Pichler, M., Schaffartzik, A., & Krausmann, F. (2020). Scrutinizing the great acceleration: the anthropocene and its analytic challenges for social-ecological transformations. *Anthropocene Rev*, 7(1), 42–61. <https://doi.org/10.1177/2053019619895034>
- Harangozo G, Csutora M, Kocsis T (2018) How big is big enough? Toward a sustainable future by examining alternatives to the conventional economic growth paradigm. *Sustain Develop* 26(2):172–181. <https://doi.org/10.1002/sd.1728>

- Hickel J, Kallis G (2020) Is green growth possible? *New Political Economy* 25(4): 469–486. <https://doi.org/10.1080/13563467.2019.1598964>
- Hoppe T, Graf A, Warbroek B, Lammers I, Lepping I (2015) Local governments supporting local energy initiatives: Lessons from the best practices of Saerbeck (Germany) and Lochem (The Netherlands). *Sustainability* 7(2):1900–1931. <https://doi.org/10.3390/su7021900>
- Hossain M (2016) Grassroots innovation: A systematic review of two decades of research. *J Cleaner Production* 137(September 2015):973–981. <https://doi.org/10.1016/j.jclepro.2016.07.140>
- IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from <https://www.ipcc.ch/report/ar6/wg1/>
- Jackson T (2008) Where is the “wellbeing dividend”? Nature, structure and consumption inequalities. *Local Environment* 13(8):703–723. <https://doi.org/10.1080/13549830802475625>
- Jackson T, Victor PA (2020) The transition to a sustainable prosperity—a stock-flow-consistent ecological macroeconomic model for Canada. *Ecological Economics* 177(July):106787. <https://doi.org/10.1016/j.ecolecon.2020.106787>
- Jarvis H (2019) Sharing, togetherness and intentional degrowth. *Progress in Human Geography* 43(2):256–275. <https://doi.org/10.1177/0309132517746519>
- Johanisova N, Crabtree T, Fraňková E (2013) Social enterprises and non-market capitals: A path to degrowth? *J Cleaner Production* 38:7–16. <https://doi.org/10.1016/j.jclepro.2012.01.004>
- Johanisova, N., Surinach Padilla, R., & Parry, P. (2014). Co-operatives. In *Degrowth: A Vocabulary for a New Era* (pp. 152–155).
- Kallis G, March H (2014) Imaginaries of hope: The Utopianism of Degrowth. *Ann Assoc Am Geographers* 105(2):360–368. <https://doi.org/10.1080/00045608.2014.973803>
- Kallis G, March H (2015) Imaginaries of hope: the utopianism of degrowth. *Ann Assoc Am Geographers* 105(2):360–368. <https://doi.org/10.1080/00045608.2014.973803>
- Kallis G, Kerschner C, Martinez-Alier J (2012) The economics of degrowth. *Ecolo Econ* 84:172–180. <https://doi.org/10.1016/j.ecolecon.2012.08.017>
- Khmar Y, Kronenberg J (2020) Degrowth in the context of sustainability transitions: in search of a common ground. *J Cleaner Production* 267:122072. <https://doi.org/10.1016/j.jclepro.2020.122072>
- Kosko B (1986) Fuzzy cognitive maps. *International Journal of Man-Machine Studies* 24(1):65–75. [https://doi.org/10.1016/S0020-7373\(86\)80040-2](https://doi.org/10.1016/S0020-7373(86)80040-2)
- Kotler P (2010) *The prosumer movement*. In *Prosumer Revisited*. VS Verlag für Sozialwissenschaften, Wiesbaden, pp 51–60. https://doi.org/10.1007/978-3-531-91998-0_2
- Kunze C, Becker S (2015) Collective ownership in renewable energy and opportunities for sustainable degrowth. *Sustainability Science* 10(3):425–437. <https://doi.org/10.1007/s11625-015-0301-0>
- Latouche S (2010) Degrowth. *J Cleaner Production* 18(6):519–522. <https://doi.org/10.1016/j.jclepro.2010.02.003>
- Lewin K (1946) Action Research and Minority Problems. *J Soc Issues* 2(4):34–46. <https://doi.org/10.1111/j.1540-4560.1946.tb02295.x>
- Liettaert M (2010) Cohousing’s relevance to degrowth theories. *J Cleaner Production* 18(6):576–580. <https://doi.org/10.1016/j.jclepro.2009.11.016>
- Lockyer J (2017) Community, commons, and degrowth at Dancing Rabbit Ecovillage. *J Political Ecology* 24(1):425–466. <https://doi.org/10.2458/v24i1.20882>
- Lorendahl B (1996) New cooperatives and local development: a study of six cases in Jämtland Sweden. *J Rural Studies* 12(2):143–150. [https://doi.org/10.1016/0743-0167\(96\)00006-X](https://doi.org/10.1016/0743-0167(96)00006-X)
- Mashlakov A, Pournaras E, Nardelli PHJ, Honkapuro S (2021) Decentralized cooperative scheduling of prosumer flexibility under forecast uncertainties. *Applied Energy* 290:116706. <https://doi.org/10.1016/j.apenergy.2021.116706>
- Massey DS (1996) The age of extremes: Concentrated affluence and poverty in the twenty-first century. *Demography* 33(4):395–412. <https://doi.org/10.2307/2061773>
- Meadows, D. H. (2009). *Thinking in systems*. (D. (Sustainability I. Wright, Ed.). London, UK: Earthscan. <https://doi.org/10.1080/09644016.2011.589585>
- Mills C, Davies W (2013) *Blueprint for a Co-Operative Decade*
- OECD (2020) *Beyond growth (New Approaches to Economic Challenges)*. OECD. <https://doi.org/10.1787/33a25ba3-en>
- El Pais. (2013). Red revival: why communism is alive and well in crisis-hit Portugal. Retrieved from http://elpais.com/elpais/2013/10/07/inenglish/1381168014_804776.html
- Piketty T (2014) *Capital in the Twenty-First Century*. Harvard University Press
- Proka A, Loorbach D, Hisschemöller M (2018) Leading from the Niche: Insights from a strategic dialogue of renewable energy cooperatives in the Netherlands. *Sustainability (Switzerland)* 10(11):6–16. <https://doi.org/10.3390/su10114106>
- Ramanath AM, Gilber N (2004) The design of participatory agent-based social simulations. *J Artificial Soci Social Simulation* 7(4) Retrieved from <https://www.jasss.org/7/4/1.html>
- Ritzer G, Dean P, Jurgenson N (2012) The coming of age of the prosumer. *Am Behav Scientist* 56(4):379–398. <https://doi.org/10.1177/0002764211429368>
- Rommel J, Radtke J, von Jorck G, Mey F, Yildiz Ö (2018) Community renewable energy at a crossroads: A think piece on degrowth, technology, and the democratization of the German energy system. *J Cleaner Production* 197: 1746–1753. <https://doi.org/10.1016/j.jclepro.2016.11.114>
- Roysen R, Mertens F (2019) New normalities in grassroots innovations: the reconfiguration and normalization of social practices in an ecovillage. *J Cleaner Production* 236. <https://doi.org/10.1016/j.jclepro.2019.117647>
- Schmelzer M (2015) The growth paradigm: History, hegemony, and the contested making of economic growthmanship. *Ecological Economics* 118: 262–271. <https://doi.org/10.1016/j.ecolecon.2015.07.029>
- Schneider F, Kallis G, Martinez-Alier J (2010) Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. Introduction to this special issue. *J Cleaner Production* 18(6):511–518. <https://doi.org/10.1016/j.jclepro.2010.01.014>
- Schuman S (2005) *The IAF Handbook of Group Facilitation: Best practices from the leading organization in facilitation*. Josse-Bass, San Francisco, CA
- Schwartzman D (2012) A critique of degrowth and its politics. *Capitalism, Nature, Socialism* 23(1):119–125. <https://doi.org/10.1080/10455752.2011.648848>
- Scott RJ, Cavana RY, Cameron D (2016) Recent evidence on the effectiveness of group model building. *Eur J Operational Res* 249(3):908–918. <https://doi.org/10.1016/j.ejor.2015.06.078>
- Sebhatu KT, Gezahegn TW, Berhanu T, Maertens M, Van Passel S, D’Haese M (2020) Conflict, fraud, and distrust in Ethiopian agricultural cooperatives. *J Co-Operative Organ Manag* 8(1):100106. <https://doi.org/10.1016/j.jcom.2020.100106>
- Sekulova F, Kallis G, Rodriguez-Labajos B, Schneider F (2013) Degrowth: From theory to practice. *J Cleaner Production* 38:1–6. <https://doi.org/10.1016/j.jclepro.2012.06.022>
- Slade Shantz AF, Kistruck GM, Pacheco DF, Webb JW (2020) How formal and informal hierarchies shape conflict within cooperatives: a field experiment in Ghana. *Acad Manag J* 63(2):503–529. <https://doi.org/10.5465/amj.2018.0335>
- Stave K (2010) Participatory system dynamics modeling for sustainable environmental management: Observations from four cases. *Sustainability* 2(9):2762–2784. <https://doi.org/10.3390/su2092762>
- Sterman J (2000) *Business dynamics: systems thinking and modeling for a complex world*. Irwin/McGraw-Hill, Boston
- Suriñach Padilla R (2012) Innovaciones Comunitarias en Sostenibilidad. ¿Cómo lidera la sociedad civil? In *Cambio Global en España 2020/50* (pp. 124–138)
- Urhammer E, Røpke I (2013) Macroeconomic narratives in a world of crises: an analysis of stories about solving the system crisis. *Ecological Economics* 96: 62–70. <https://doi.org/10.1016/j.ecolecon.2013.10.002>
- Vennix JAM (1996) *Group model building*. Wiley, Chichester Retrieved from <https://books.google.nl/books?id=F4ciAQAAAMAJ>
- Videira N, Schneider F, Sekulova F, Kallis G (2014) Improving understanding on degrowth pathways: An exploratory study using collaborative causal models. *Futures* 55:58–77. <https://doi.org/10.1016/j.futures.2013.11.001>
- Voinov A, Kolagani N, McCall MK, Glynn PD, Kragt ME, Ostermann FO et al (2016) Modelling with stakeholders - Next generation. *Environment Modelling Software* 77:196–220. <https://doi.org/10.1016/j.envsoft.2015.11.016>
- Whetten D (2014) Modelling-as-theorizing: a systematic methodology for theory development. In *Essential Skills for Management Research* (pp. 46–71). 1 Oliver’s Yard, 55 City Road, London EC1Y 1SP United Kingdom: SAGE Publications Ltd. <https://doi.org/10.4135/9781848605305.n3>
- Wiedmann T, Lenzen M, Keyßer LT, Steinberger JK (2020) Scientists’ warning on affluence. *Nature. Communications* 11(1):3107. <https://doi.org/10.1038/s41467-020-16941-y>
- Xue J (2014) Is eco-village/urban village the future of a degrowth society? An urban planner’s perspective. *Ecological Economics* 105:130–138. <https://doi.org/10.1016/j.ecolecon.2014.06.003>
- Yildiz Ö, Rommel J, Debor S, Holstenkamp L, Mey F, Müller JR, Radtke J, Rognli J (2015) Renewable energy cooperatives as gatekeepers or facilitators? Recent developments in Germany and a multidisciplinary research agenda. *Energy Research & Social Science* 6:59–73. <https://doi.org/10.1016/j.erss.2014.12.001>

Publisher’s Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.