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Master Thesis

Citizen science for sustainable development on the Greek island of Samothraki: exploring the process of a local collaboration

submitted by

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Αφιερωμένο στην νησιωτική Σαμοθρακική ζωή.



Picture from Lennard Schweer

Abstract:

Citizen science stellt einen Ansatz dar, der zunehmend in Umweltstudien angewandt wird, die sich mit der Beteiligung von BürgerInnen an Forschungsvorhaben befassen. Verschiedene Typologien definieren das Ausmaß, in dem die Öffentlichkeit in den Forschungsprozess einbezogen wird. Co-created Projekte stellen einen Typus dar, der darauf abzielt, BürgerInnen als gleichberechtigte PartnerInnen in verschiedene Teile der Forschung einzubeziehen. Eine Zusammenarbeit, die letztlich die Demokratisierung der Forschung und die gleichberechtigte co-produktion von Wissen durch WissenschaftlerInnen und BürgerInnen anstrebt. Diese qualitative Fallstudie untersucht ein solches Projekt auf der griechischen Insel Samothraki von 2016 bis 2018. Im Zentrum dieser Untersuchung steht die Zusammenarbeit zwischen sozialökologischen ForscherInnen und der Sustainable Samothraki Association (SUSA). Der theoretische Ansatz zur Untersuchung dieser Zusammenarbeit basiert auf der Citizen Science Literatur. Darüber hinaus wird das Konzept 'Islandness' herangezogen, um ein tieferes Verständnis für den spezifischen Fall Samothraki zu entwickeln. Als übergreifendes Paradigma bereichert eine feministische Theorie das theoretische Verständnis. Dies erlaubt geschlechtersensible Perspektiven und erhöhte Aufmerksamkeit für Elemente wie Macht und Handlungsfähigkeit. Die für diese Untersuchung gesammelten Daten stammen von einer sechswöchigen Exkursion auf die Insel. Während dieser Zeit wurde die 7. Sommerschule besucht, die von den sozialökologischen ForscherInnen organisiert wurde. darüber hinaus wurden Key-Informant Interviews, halbstrukturierten Interviews und Beobachtungen durchgeführt. Die Ergebnisse dieser Masterarbeit zeigen, dass die SUSA als Bindeglied zwischen der lokalen Gemeinschaft und den Forschern definiert und etabliert wurde. Sie beleuchten auch die Herausforderungen, die sich aus der Teilnahme ergeben, und die möglichen Ergebnisse wie Lernen und Sensibilisierung. Die Ergebnisse dieser Studie bieten empirische Einblicke in den Prozess der gemeinsam geschaffenen Projekte, indem sie ein besonderes Augenmerk auf die Beziehungen, die Rollen innerhalb des Projekts und die Machtstrukturen legen und dazu beitragen, Strukturen aufzudecken, die bisher wenig Beachtung gefunden haben.

Abstract:

Citizen science is increasingly applied in environmental studies concerned with citizens' involvement in research endeavors. Different typologies define the extent to which the public is involved in the research process. Co-created projects represent one type that aims to include citizens as equal partners in several parts of the research. A collaboration that ultimately strives for the democratization of research and equal co-production of knowledge by scientists and citizens. This qualitative case study explores such a project on the Greek island of Samothraki from 2016 to 2018. At the center of this research is the collaboration between socioecological researchers and the Sustainable Samothraki Association (SUSA). The theoretical approach to explore this collaboration uses the CS literature. Furthermore, to develop a deeper understanding of the specific case of Samothraki, the concept of islandness is drawn upon. As an overall paradigm, feminist theory enriches this theoretical understanding by adding a gender-sensitive perspective and drawing attention to elements such as power and agency. The data collected for this investigation come from a six-week field trip to the island. During this time, the 7th summer school organized by the socioecological researchers was attended. This was then combined with collecting data from key informant interviews, semi-structured interviews, and observations. The results of this master thesis show that the SUSA was defined and established as a link between the local community and the researchers. It also illuminates challenges faced through participation and possible outcomes such as learning and awareness-raising. The findings of this study offer empirical insights into the process of co-created projects by paying particular attention to relationships, roles within the project, and power structures, helping to reveal structures that have received little attention to date.

Keywords: Citizen science, co-created projects, islandness, feminist political ecology, power, participation in research

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1. Introduction

In the media, islands are usually portrayed as places with unique natural wilderness and a sense of harmony and peace (Baldacchino, 2008; Nimführ et al., 2021). Not only do islands attract tourists, but they are also of interest to researchers because of their supposed cultural and ecological uniqueness (Baldacchino, 2006). While this image of paradise may hold for visitors, for islanders, this hardly seems to mirror their reality of life (Nimführ et al., 2021). This is expressed in the concept of *islandness*, indented to capture island existence and experience as an identity (Stratford, 2008). Originated from island studies, this concept emphasizes the need to study islands on their own terms rather than attempting to impose an outsider view on them (Baldacchino, 2006).

The island of Samothraki has become the center of such research interest seeking to apply *islandness* and its principles. The transdisciplinary research "Sustainable Samothraki" presents an approach based on a socio-ecological investigation in this context. Research from different angles has been conducted on the island for over a decade. First, by highlighting the cultural long history, which unfolds on the island in the northern Aegean Sea. Once celebrated as the "sanctuary of the great gods" in ancient Greece, the island accommodated religious ceremonies and, thus, is a popular destination to admire archaeological excavations today (Fischer-Kowalski et al., 2011, 2020; Noll et al., 2020). Secondly by outlining the ecological characteristics of the island. The most prominent landmark, Mount Fengari of volcanic origin, rises 1,611 meters. The mountain allows for unique natural features and special climatic conditions. In the north of the island, a humid microclimate, freshwater ponds, and plenty of waterfalls provide lush green vegetation and ancient forests. In the south and west prevail a more typical Mediterranean climate and vegetation (Fischer-Kowalski et al., 2011). This varied landscape creates diverse habitats that are home to a variety of species. A designated Natura 2000 site protects large parts of the island and the surrounding sea (Fischer-Kowalski et al., 2011).

The previous socioecological research furthermore offers insights into the entangled natural and social conditions of the island's. Samothraki, from this perspective is described by the research team as not yet developed by mass tourism. Still appreciated and loved for its 'remoteness' by visitors, tourism however represents an important economic sector. While around 3.000 people live on the island permanently (Census 2001)¹, about 40.000 tourists are estimated to visit the island yearly (Fischer-Kowalski et al., 2011). With the island's integration into the global trade network in the 20th century, conditions began to change for the island's economy, which had long been dominated by agriculture. This was followed by the beginnings of tourism on the island around 1980 (Fischer-Kowalski et al., 2011; Noll, 2021). Accompanying challenges were observed following this transformation, e.g., in infrastructure such as waste and water management (Noll, 2021). Although the number of people employed in the tertiary

¹ Census data from local authorities in (Fischer-Kowalski et al., 2011)

sector (mainly tourism, trade and services) has increased since 1980, 45% of the island's inhabitants are still active in the primary sector (Fischer-Kowalski et al., 2011).

The primary sector, composed of farming, animal husbandry and fishing, is considered a significant source of income on the island (Fischer-Kowalski et al., 2011). The most important form of agriculture consists of small ruminants such as sheep and goats. This tradition, which has existed in the Mediterranean for a long time, is considered socially and ecologically valuable. Small ruminant farming is usually practiced on a small scale, contributing to rural development. From an ecological perspective, diverse landscapes can unfold through grazing animals. Pressures on the agricultural sector, seen elsewhere, have led to a shift from the keeping of diverse livestock to the steadily increasing number of small ruminants kept on the island since the 1960s (Noll et al., 2020). In this context, it was identified that the Common European Agricultural Policy (CAP), through the allocation of subsidies, played a dominant role (Noll et al., 2020). As a result, the research group noted increased grazing pressure, soil erosion, and destruction of the forest due to the animals' demand for fodder. This has led to a common practice of buying additional feed for the animals, which results in additional expenses for the farmers. This factor, along with the generally low income of livestock farmers, has contributed to the decline in the number of farmers on the island since 1970, which "threatens the very basis of farming on the island" (Noll et al., 2020, p. 11). Fishing, more precise trawling, and drift net fishing contribute to overfishing in the area, leaving especially small fishers vulnerable (Fischer-Kowalski et al., 2011).

The case of Samothraki illustrates the intertwining of environmental concerns with social conditions. Alan Irwin begins his book, *A Study of People, Expertise and Sustainable Development*, emphasizing this relationship. He describes that environmental problems originate from social problems and how people deal with their environment. Sustainability can, therefore, only be pursued through the involvement of affected citizens (Irwin, 1995). In continuation of this, he then emphasizes the necessity within the environmental debate not only to consider the experience and knowledge of citizens concerned with these problems but to involve them in the pursuit of solutions actively. Citizen Science (CS) is advocated as an approach in relation to considering the above (Irwin, 1995). As a Citizen Science Global Partnership speaker framed it at the United Nations Environment Assembly in Nairobi, 2017: "Professional science alone cannot provide information at the scales and resolutions necessary to understand environmental change. The dominant culture of scientific expertise does not account for different ways of knowing and often fails to engage the public." (Bowser et al., 2018).

Practitioners more general have described CS as a tool, a method, and a form of research collaboration between scientists and citizens (Eitzel et al., 2017). In the face of this, various projects applying CS principles unfold in the field. Co-created CS projects hereby present the possibility of including citizens in all stages of research (Bonney et al., 2009). This design is increasingly promoted as holding the potential to achieve community empowerment and

subsequent change on a local level. While it has been praised as such, little evidence in the form of case studies is available in the literature.

Inspired by the university course 'Food, Gender, and Natural Resources' promoting gender-sensitive methods in scientific research, the idea emerged to look at the Samothraki case and previous socioecological research from a feminist perspective. Through this initial approach, attention was drawn to elements such as power, politics, and knowledge. Aspects that are ultimately central for CS to fulfill one of its core principles of democratizing research. Combined with a strong personal interest in community-led sustainability efforts and intrigued by Greek culture through a visit in 2021, field research on the island was planned for the summer of 2022. The local context eventually led to an investigation of the CS project initiated by socioecological researchers on the island.

To respond to this above-mentioned lack of examples, this master's thesis seeks to examine the period between 2016 and 2018 of the "Sustainable Samothraki" research. At the center of this research is citizen science as an approach to work closely with local groups to find solutions. It aims to "...improve the outcome of scientific research, but also empower citizens to find creative solutions" (Petridis et al., 2017, p. 124). A starting point for this collaboration is the political and social ambition of the island to become a UNESCO biosphere reserve (Petridis et al., 2017). Biosphere parks can be defined as "learning sites for sustainable development" and combine the functions of conservation and cultural diversity, sustainable economic development, and research-based learning processes (UNESCO, n.d.).

This master's thesis thus seeks to answer the question: *How did the process of collaboration between researchers and local actors unfold under the umbrella of citizen science?* To examine how the citizen science approach was applied in the process and to be able to investigate the underlying process of this collaboration between the two actor groups, sub-research questions ask:

- *How did the collaboration come about?*
- *How did the collaboration develop over time?*
- *What were perceived challenges met during this process?*
- *What outcomes could be observed in the process?*

Given these objectives, this master thesis has been designed to answer the research question gradually. This brief introduction to the topic is followed by a literature review of the concept of applied citizen science (CS) in *Chapter 2.1*. Both its origins and applications in environmental science are elaborated. The literature is then reviewed on sustainable island research and related concepts such as *islandness* and their relevance to the case of Samothraki. The final step examines CS applications working with and for local actors in more detail. The literature review identifies a knowledge gap in the study of such processes of co-created projects. In response to this, *Chapter 2.2*. develops a theoretical approach to study this gap using CS

principles. In addition, other integrated concepts, such as *islandness* and a feminist paradigm, are described, and how they seek to enrich this research. *Chapter 4.* provides a detailed explanation of the research design and how this case study was approached. It also explains the methodological choices made and the limitations associated with them. *Chapter 5.* analyzes the collected data considering the research questions by examining the motivations and starting points of the CS project. This is followed by CS applications in practice. Finally, the perceived challenges and outcomes are presented. *Chapter 6.* correlates the findings with the available literature and discusses them, while *Chapter 7.* summarizes the results of this research and makes concluding remarks.

2. Theoretical approach

This chapter draws on the theoretical concepts utilized in this thesis. The first part focuses on the literature on CS, the origins of this approach, the general applications, virtues, and limitations of it (2.1.1). Thereafter literature on sustainable development and island studies (2.1.2), which includes relevant concepts for the study of islands in general. In addition, the specific literature on the role of local actors in CS projects is examined (2.1.3). Finally, research on the island of Samothraki is summarized and explored in more detail in (2.1.4.) These subsections serve as the basis for the second part where the theoretical framework used in this research will be presented.

2.1 Literature review

2.1.1 Citizen Science: origins and general applications

Citizen science (CS) as a form of research has continuously gained importance in scientific discourse over the last decades. Especially in the environmental and ecological sciences CS demonstrates its potential for advanced data collection and public involvement in research (Fraisl et al., 2022; Sauermann et al., 2020). While several definitions exist (Eitzel et al., 2017), increasing references are made to CS as "engaging the public in a scientific project" (Kobori et al., 2016, p. 2). And while this explanation leaves broad room for interpretation, it outlines the principles on which CS is based (Strasser et al., 2018). Firstly, it is an attractive term for research projects to denote their participatory nature: "doing science WITH citizens." The participatory attribute ultimately contributes to similarities with other approaches. Thus, linked terms will be reviewed later in this chapter. The second principle in CS: "doing science FOR people," is often connected with the emergence of CS itself (Irwin, 1995; Strasser et al., 2018). In continuation, the origins of CS will be elaborated on as a first step.

To explain the practice used today, some scholars take up a historical perspective of CS. Literature first sees CS partly as a reaction to social movements demanding more people-centered science in the 1960s and 1970s. The radical science movement, as one example, was

characterized by a general dissatisfaction about how science was done, perceiving an inability of scientific institutions to respond to social issues and to serve people's interests (Göbel et al., 2021; Sauermann et al., 2020). It was within this period that other related concepts, such as 'Participatory Action Research' (PAR), also known as 'Community Action Research' (CAR), rose in popularity (Eitzel et al., 2017). Inspiration for these participatory approaches can be found in John Dewey's elaboration on public participation in democracy, as well as in Paulo Freire's call for "human-centered approaches to addressing social issues" (Colston et al., 2015, p. 3; Freire, 1970). Richard Chambers, in this connection, has been described as influential in pushing for those participatory approaches in development research (Chambers, 1994; Parnwell et al., 2019). Citizen science as a label, however, only started appearing in publications in the 1990s (Eitzel et al., 2017). Thus, PAR has been described as a related yet older approach. Whereas PAR is observed more in educational and social sciences, centering around social and environmental justice, contemporary CS is more prominent in natural science (Vadjunec et al., 2022).

The European Citizen Science Association generally describes citizen science as a "flexible concept that can be adapted and applied in different situations and disciplines" (ECSA, 2015, p. 1). Various overlaps can thus be observed with other disciplines, applying similar concepts (Kullenberg et al., 2016). Environmental justice refers to 'Community-Based Participatory Research' (CBPR). The term 'crowdsourcing' describes the collection of data, ideas, or services from people, especially using online tools and resources, and thus shares strong similarities with CS contributory projects. Literature thus indicates that a variety of different projects obtain and use the label citizen science (Eitzel et al., 2017). The field is, therefore, sometimes even described as developing faster than terms and explanations can account for, which leads to challenges in drawing lines between practices, terms used, and those implications (Haklay et al., 2020).

Two significant interpretations shape CS. Alan Irwin's description of citizen science in his 1995 book, "Citizen Science: A Study of People, Expertise and Sustainable Development" (Irwin, 1995), is in favor of "science for and by the people." His book emphasizes local and contextualized knowledge and the necessity to take this knowledge into account to fulfill democratic research. In contrast, Richard Bonney then emphasized the productivity aspect of citizen science. He described the approach as non-experts helping to generate data and thereby contributing to increased productivity and efficiency within knowledge creation (Bonney, 1996). In return, participants acquire scientific skills, thus creating a win-win situation. This view does not challenge the prevailing view that researchers are superior to the public knowledge-wise and in achieving significant scientific outputs (Sauermann et al., 2020; Strasser et al., 2018).

Literature furthermore widely engages with frequently promised and hoped-for virtues of CS. This includes democratization, as mentioned above, of science, new scientific knowledge, and a broad promise of learning within the process. The underlying assumption is that the involvement of society in research and policy contributes to more relevant and equitable

results and decisions. Acceptance of decisions can be improved by including knowledge and ideas from broader society (Agnello et al., 2021). This contributes to its popularity, especially in the face of big crises like climate change, biodiversity loss, and more general sustainability issues based on the necessity of acceptance and adoption by society (Sauermann et al., 2020).

Scholars, however, highlight the necessity to critically examine the central claims of CS more carefully (Kimura et al., 2016; Strasser et al., 2018). First of all, the assumption of democratization and new scientific insights requires a closer look at the domain of participation (Strasser et al., 2018). Participation in citizen science encompasses levels of involvement and motivation to participate. Primary sources of inquiry in this regard draw on research on volunteering in general (Agnello et al., 2021). Both aspects are ultimately critical to engage citizens purposefully and sustain their engagement. To monitor mutual benefit for researchers and volunteers alike, reflections are encouraged. Mutual gains are emphasized to use the public as more than just a low-cost partner for research purposes (Kimura et al., 2016). Challenges such as time constraints and loosening commitment and motivation may arise in projects (Agnello et al., 2021).

Another crucial aspect lies in the diversity of participation. Democracy ultimately requires power distribution among all citizens, regardless of ethnicity, gender, education, age, or ability, among many axes (Argyri et al., 2021; Strasser et al., 2018). To ensure access to science for all, it is essential to examine this dimension in projects. While there is not yet an in-depth review of who participates in CS projects, country- and project-specific data indicate unbalanced participation patterns. Insights from research conducted in the US and UK draw a picture from CS volunteers, mainly white people with higher socio-economic backgrounds and education qualifications. Groups historically underrepresented in science stay in the background (Argyri et al., 2021).

The third promise is learning through CS projects, which seems to be the most commonly anticipated, yet the most complex to study (Stepenuck et al., 2015). Important key concepts in this regard revolve, on the one hand, around scientific literacy, which aims to make the public familiar with scientific inquiry and thus contribute to the public understanding of science (PUS) (Bonney et al., 2016). The literature here points to a common assumption among practitioners that learning and knowledge can be gained in the process. However, Bonney and colleagues stress that learning does not simply occur. For one thing, it is not easily measured. In addition, a commitment to reflection is a prerequisite for gaining insights into possible learning successes or mistakes (Bonney et al., 2016). This appears to be especially relevant since learning is a highly individual and personal process that can vary from project to project (Golumbic et al., 2021).

Studies show that while participants' content knowledge can increase by being involved in the research, their understanding of the scientific process and their view of scientific institutions do not significantly change. Moreover, longer-term committed volunteers were found to be engaged and interested in contributing to the specific topic before the project's start (Mueller

et al., 2011). Thus, a lack of systematic review of the learning potentials of CS projects often leads to an optimistic estimation of those. In summary, potentials such as transformative learning, scientific literacy, and related social empowerment are often highlighted by CS. However, this needs to be considered in project design and implementation to assess it afterward. Such examples are absent in practice (Bela et al., 2016).

2.1.2 The concept of sustainable islands and sustainable development

Islands, generally, are being referred to in the literature as a compelling way to look at sustainable development. The insularity is seen as helpful in creating 'a real-life laboratory', setting natural boundaries, and controlling relevant variables more easily (Karampela et al., 2017). Establishing these boundaries, however, is becoming increasingly challenging in the face of globalization and the intertwining of the social fabric between islanders, mainlanders, and tourists (Kerr, 2005).

Within the development paradigm, literature tends to focus on economic metrics, displaying insularity itself as the reason for vulnerabilities. Expressed through economic, political, and social dependencies on the mainland, low returns in industrial and agricultural production, and geographic remoteness (Clark, 2013; Kerr, 2005; Petridis et al., 2017). Solutions to environmental problems in this context are, among other things, the commercialization of nature. This unfolds in the context of islands, primarily through tourism. Democratic decision-making about natural resource management is, through this approach, however, seen poorly realized (Clark, 2013). Therefore, viewing sustainability on islands through a neoliberal lens is described as problematic ignoring power structures, environmental impacts, and broader structural issues (Petridis et al., 2017).

Since 1994 through the Barbados Action Program for Sustainable Development, increased attention has been given to "small island developing states". Firstly, at the forefront of environmental change and accompanying challenges but moreover as potentially crucial in creating alternative pathways to sustainability and accompanying research (Baldacchino, 2006; Stratford, 2008). This was accompanied by a general recognition of islands and further island initiatives from intergovernmental organizations like UNESCO, UNDP, the World Bank, and the European Union (Baldacchino, 2006). Literature, however, points to the tendency of empirical research focused mainly on islands associated with this label, located in the global south (Stratford, 2008).

Exploring sustainable development research on islands ultimately includes 'island studies' and its concepts. The discipline criticizes 'disempowered' research about islanders instead of research for or with islanders in the past. Island studies generally is described as "*[...] primarily an inter-, or even trans-, disciplinary focus of critical inquiry and scholarship*" (Baldacchino, 2006, p. 9). The emphasis lies on studying "*islands on their own terms*" and centers on *islandness* as a critical concept in this field (Baldacchino, 2008, p. 37). *Islandness*, a concept open to various interpretations, is frequently referred to as an experiential identity. "*[...]*"

islandness might be described as a particular (and inevitably contingent) sense of being in place, although no inference is made here about that sense being necessarily harmonious." (Stratford, 2008, p. 161). This island identity is seen as being defined through an open yet closed system (Kallis et al., 2022). Studying islands and socio-environmental systems thus sees an emphasis on those multilayered identities. They are described as shaping human interactions as well as human-nature relationships, consequently determining the actions of socio-economic structures and political processes (Baldacchino, 2006; Kallis et al., 2022)

Sustainable development in a Greek context, shown through a meta-analysis reviewing 80 papers on sustainable local development on Aegean islands, highlighted the focus of research on tourism in this relation (Karampela et al., 2017). However, alternative forms of mass tourism are rather scarcely discussed. Next to tourism, infrastructure-related topics such as energy, water supply, and transportation are discussed. The authors see a lack of social aspects in the literature and the interconnection with environmental and economic factors. Nevertheless, 'cooperation' and 'networking' has been highlighted in case studies to prove influential. Aspects described in the report as a difficulty in the island context of Greece, due to limited human resources. However, the necessity of social agents in decision making was mentioned. Despite the possibility of exploring sustainable pathways on islands, the authors conclude that islands represent a complex system of interactions involving many factors. They emphasize that islands should not be considered solely as an entity without influence or connections from the outside. Archipelagos, as found in Greece, can help explore alternative development pathways (Karampela et al., 2017).

2.1.3 The role of local actors in citizen science projects

To navigate the broad field of project application in CS, typologies have been introduced to categorize projects. One commonly used typology comes from a research group led by Richard Bonney, dividing projects into contributing, collaborative, and co-created ones. It characterizes the degree of citizen participation in the project's design (Bonney et al., 2009). Put simply, in contributing projects, citizens are solely involved in data collection, while they are also involved in data analysis in collaborative projects. In co-created projects, on the other hand, citizens are invited to participate in almost all phases of the research, including the research design (Bonney et al., 2009).

Co-designed projects are reported to often originate from communities that face environmental change. In these cases, it has been reported that both citizens and researchers are more incentivized to work on and engage in the project (Ansine et al., 2018; Gunnell et al., 2021). Engaging participants more deeply in the research process is furthermore seen as holding potential for more accurate interpretations "*grounded in the reality and context of the community in need*" (Gunnell et al., 2021, p. 3).

Co-created projects are described in the literature as the most appropriate means for fostering community empowerment. This type of approach, however, poses several

challenges and limitations (Gunnell et al., 2021). Barriers to implementation are identified through resource limitations. First is the possibility of mobilizing funding since the direction such projects go might be uncertain initially (Gunnell et al., 2021). Second, it raises the need for power to be shared or shifted between actors, which may be challenging for traditional academic practitioners (Gunnell et al., 2021). In addition, because an inherent power dynamic exists due to the superior role of scientists in knowledge production, the relationships between the actors involved need to be carefully reflected on (Eitzel et al., 2017). In addition, Shirk et al. (2012) note that individuals or communities have considerable responsibility in co-created projects. These responsibilities relate to "recruiting and retaining volunteers" and committing to processes of reaching consensus, planning, and implementing actions. In addition, they describe a typically slower process in such projects (Shirk et al., 2012, p. 11).

As a result, the literature identifies a lack of practical experience with co-created projects and insights into overcoming the associated challenges. Useful experience can be found in the PAR literature. A central tenet of this practice is considering power within the research process and beyond. This is done through ongoing reflection with all participants, continuing after the research is completed. In addition, questions are asked about who is involved, who decides this, and why (Benjamin-Thomas et al., 2018). The difference between those and co-created projects is seen in the emphasis on action and problem-solving within PAR (Froeling et al., 2021).

This is exemplified by insights from a research project in the United States complementing CS with PAR principles (Vadjunec et al., 2022). Answers can be found in how to design and apply participatory methods. In the initial research phase, they encourage collaboration with existing community-based initiatives in the field before the project starts. They then highlight the need to align the research agenda with community goals and not mobilize such initiatives only for research purposes. This seems particularly important for this case study since the CS project was ultimately decisive how the Sustainable Samothraki Association (SUSA) was defined and the roles the association took in the project. They, moreover, promote diverse engagements in the field, such as the organization of student schools in the area, which leads to social capital in the field and familiarizes students with participatory research (Vadjunec et al., 2022), as can be related to the summer school organized on Samothraki.

Other interesting findings come from CS research in urban sustainability initiatives. By integrating PAR ideas that focus on social and environmental justice and political ecology, they draw attention to power relations. They emphasize the need to consider the relationship between researchers and participants. Most relevant to this research seems to be the emphasis on the project process, which is claimed to help evaluate who is involved and in what ways. This, in turn, is seen as necessary to unleash the potential of CS for social and environmental just solutions and to ensure that communities are at the center of sustainability efforts (Colston et al., 2015).

Another relevant contribution comes from a paper applying CS principles to the food sovereignty literature (Pimbert, 2006). CS as a concept is not referenced, but similarities are apparent. Considering this work relevant to the Samothraki case stems from challenges and struggles over the food system on the island. The author identifies citizenship as a key concept for locally self-determined food systems and related development. Policy in this context is described as "too important to be left to professionals" (Pimbert, 2006, p. 16). As a prerequisite for active citizenship, the author sees the transformation of knowledge as a central component. The need for this is identified in several areas relevant to the content of this master's thesis. For example, overcoming knowledge narratives that justify neoliberal development interventions by implying environmental degradation to specific groups such as farmers. Furthermore, to challenge the prevailing economic system determined by a growth narrative that leads to policies responsible for the "economic genocide of farmers and rural livelihoods" (Pimbert, 2006, p. 7). Informed and deliberate decisions by citizens can be learned through experience. Experience, in this case, must come from participation in knowledge production, which ultimately should democratize research. Finally, the author urges scientists to empower people to reclaim their knowledge in order to exercise their rights and take responsibility for their food systems and their future pathways. (Pimbert, 2006). Thus, the paper strengthens the CS approach and adds a theoretical context of peasant rights to Samothraki.

Civil Society Organizations (CSOs) have generally been identified by (Strasser et al., 2018) and (Göbel et al., 2021) as relevant actors in participatory approaches, yet often overlooked in the CS literature. For one, they highlight them as agents of transformative knowledge. Transformative knowledge is understood as knowledge necessary for taking action toward more sustainable pathways (Urmetzer et al., 2020). Furthermore, they hold the potential to *"bring together those who are typically excluded from research processes, advocate for their perspectives, do research, and establish links to institutions"* (Göbel et al., 2021, p. 333). CSOs are thus understood as relevant in connecting scientists and communities in co-created projects. Their role, potentials, and power relations between those actors are described in the literature as based on case studies, pointing to a knowledge gap in what CSOs do for CS and vice versa (Göbel et al., 2021).

Through those case studies, multiple roles of CSOs in CS projects are demonstrated, which are seen as useful in this specific context. Three leading roles are elaborated here: first, a **technical role**, which consists of helping with knowledge production, for example, by collecting data. Second, a **governance role** comes from organizing research activities and identifying relevant local issues that must be addressed. Furthermore, a third role is seen as **advocacy**, participating in the implementation of transformative knowledge in the local community (Göbel et al., 2021, p. 342). This concept of interaction between different actors is also reflected in the CS project in Samothraki, in the joint elaboration of an alternative vision of local development (Petridis, 2017).

2.1.4 Previous socioecological research on Samothraki

Exploring scientific papers on the island on google scholar² depicts research that originated in the mid-1900s and was conducted mainly in geology, ecology, and biology. The interest of historians is also part of the publications about the events and history of the island. In 2008, a more holistic approach to the island was developed in the form of a transdisciplinary socioecological research project, which accounts for most of the publications about the island currently (Petridis et al., 2017).

The previous research revolves around establishing a UNESCO Man and Biosphere Reserve (short MAB) and consists of several funded research projects (Fischer-Kowalski et al., 2011, p. 189; Petridis et al., 2017, p. 119). The bio reserve (BR) concept is based on three pillars: nature protection, supporting local communities with their development trajectories, and fostering learning, training, and education (UNESCO, n.d.). The first research phase, from 2007 until 2011, was guided by feasibility studies for the MAB implementation on the island (*Sustainable Samothraki*, n.d.). The socioecological researchers identified this model as an attractive way to combine conservation efforts and social-economic benefits for the island (Fischer-Kowalski et al., 2020).

This first phase of research focused on exploring the support of residents and tourists and further investigating the natural and social conditions of such an approach (Fischer-Kowalski et al., 2011). Results from this research period point to an ecosystem needing preservation due to threats from overgrazing by goats and sheep, subsequent erosions and unregulated freshwater extraction, and threats to marine species due to overfishing (Fischer-Kowalski et al., 2011). Semi-structured interviews³ conducted with municipal decision-makers, NGO members, entrepreneurs, the local orthodox church, and livestock farmers sought their opinions about the MAB concept. Responses from the stakeholder interviews were reported primarily positive for implementing the BR reserve.

This contrasted with the responses from livestock farmers: because of their fear of losing land rights they were skeptical of the proposal (*Samothraki Biosphere Reserve Nomination Form*, 2013). Furthermore in 2008, a survey was carried out on the question: “How would you prefer the future of Samothraki to look like?” (Fischer-Kowalski et al., 2011, p. 187). The respondents could then choose between a modernist and a conservationist scenario for the island. For the modernist scenario, the following description was given: “Samothraki as a modern tourist destination with high-class infrastructure and accessibility by air”. The latter scenario was stated as: “Samothraki as a place rich in nature and cultural traditions, a place for escape by city dwellers to find recreation in a calm environment that is well preserved” (Fischer-Kowalski et al., 2011, p. 187). As outlined in the published paper, tourists, second home owners, and

² Google scholar search on the term “Samothraki” accessed 30.01.2023

³ The interviews are not publicly available and no reference year can be retrieved

seasonal workers appear to prefer a conservation future. Permanent residents' preferences, on the other hand, were nearly the same in both scenarios. However, of the 1,511 respondents, 980 were tourists, while only 200 represented permanent residents. In addition, the paper highlights that of these permanent residents, only 8% were farmers, hence critical voices were less represented. Thus, in general, the overall impression is positive for the preservation of the island (Fischer-Kowalski et al., 2011).

The next funded project took place from 2011 to 2014. Objectives were defined in the following areas: sustainable infrastructure, waste management, and economic sectors such as agriculture, fishing, and tourism. Furthermore, the definition of management plans and establishing a local management body (Universität Klagenfurt, n.d.-a). Within this period, two applications to join the Man and Biosphere Reserve network were prepared with cooperation between the municipality and the researchers. While the first was submitted in 2011, the second was refined and resubmitted in 2013 (*Sustainable Samothraki*, n.d.). Both were rejected by UNESCO, reasoning it with incorrect legal and managerial bases concerning the Natura 2000 protected area. As described by the researchers, this setback ultimately highlighted the need for different approaches and more profound commitment from involved stakeholders on the island to pursue this pathway (Fischer-Kowalski et al., 2020).

SUSAKI, the subsequent research from 2015 to 2018, followed an approach characterized by transdisciplinary principles. Transdisciplinary research follows a rationale that bringing about change to societal problems requires diverse engagement and knowledge production from different scientific institutions and other parts of society (Lang et al., 2012). Analytically, the research is centered around a socioecological systems research approach. In the model, natural causation, cultural causation, and so-called 'hybrid' causation are considered, as seen in figure (1). Applying this model, clear boundaries were defined and did not extend beyond the island (Petridis et al., 2017, p. 122).

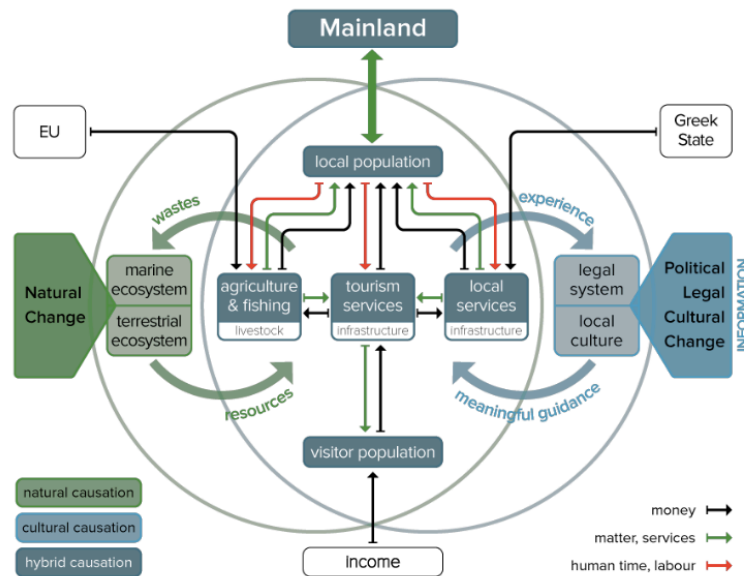


Figure 1: socioecological system model. Source: (Petridis et al., 2017).

During this socioecological research process, another project funding was acquired in 2016. CiSciSusaki (Citizen Science Sustainable Samothraki) – *"Citizen science as a key pathway to achieve effective nature conservation and a sustainability transition on the island of Samothraki"* was meant to support local initiatives and their sustainability efforts and provide institutional support to establish a UNESCO Biosphere Reserve (Universität Klagenfurt, n.d.-b). *"Citizen science involvement in socioecological research should improve the outcome of scientific research, but also empower citizens to find creative solutions. This means achieving a continuous collaboration of scientists and local stakeholders, including the municipal administration."* (Petridis et al., 2017, p. 124). Even though a collaboration between actors was described since the first project, this can be seen as an official manifestation of this collaboration. By involving local stakeholders in the research process, long-term goals were defined, such as ensuring "real, local development" ultimately owned by the local community and institutions, along with providing a setting for continuing the pursuit of sustainable solutions to environmental problems (Petridis et al., 2017, p. 124).

During the socio-ecological research, a variety of actors were engaged. To describe those local actors, distinctions such as "locals" and "neo-locals" were used. "Locals" were then described as born on the island, while "neo-locals" are reported to have moved to the island later. Next, aiming to describe origins and relating it to the island, this was used to describe differing collaboration patterns of the two mentioned groups. "Locals" follow collaboration patterns characterized by nepotism and mistrust (Fischer-Kowalski et al., 2020). Distrust was described as evolving through bad experiences with cooperatives in the 1980s and 1990s, where individuals misused their power for personal gain (Noll et al., 2020). On the contrary, "Neo-locals" are described as more open for innovative ideas and collaboration through experiences gained outside of the island (Fischer-Kowalski et al., 2020).

While such distinctions are helpful in this context, it is considered relevant to further address the social differences characterized by these groups. *Islandness* constitutes a useful concept in this relation to critically reflect on how these categorizations may frame and portray islanders. Mentions of power relations can be found in the socio-ecological research, however, they have not been engaged with further. This can be remedied by applying a feminist perspective. Based on these two concepts, the interest lies in illuminating perspectives that often remain in the background. This stems from the assumption that these can lead to more inclusive forms of transformation and creative pathways to sustainability. This approach will be further elaborated in the next chapter 2.2 *Theoretical Framework*.

2.2 Theoretical Framing

To realize the potential of CS to conduct research with and for the community, it was suggested that the process of such projects be examined in more detail (Colston et al., 2015). The process is understood as how the project was planned and implemented. Process, at the same time, includes the participating actors and their roles in the project. Reflecting on this process is deemed necessary to explore the claimed co-created nature of the project on Samothraki. Thus, this study asks:

(I) how did the collaboration process between researchers and local actors evolve under the umbrella of citizen science?

This section then reflects on the concepts from the literature review to highlight the entailed components deemed useful in developing this theoretical framework. These include the CS approach as the base for the main research question. In addition, the concept of *islandness* and the feminist paradigm, which inform the sub-research questions.

By recognizing the lack of practical experience with co-created projects, existing experience is deemed useful to inform this master's thesis and answer the research question. Definitions of co-created projects leave room for interpretation. The literature describes these projects as "[...] at least some of the public participants are actively involved in most or all steps of the scientific process" (Bonney et al., 2009, p. 11). The steps mentioned commonly revolve around shared creation of research questions, data collection, refining project design, analyzing data, or disseminating findings (Gunnell et al., 2021). These steps will therefore accompany the analysis of this thesis. The limited insights on how CS is applied in co-created projects, makes this research highly relevant (Froeling et al., 2021).

Scrutinizing the CS process results from increased attention to human-centered research. This specific approach relates to the democratization of science, which is mainly expressed and shaped by the work of Alan Irwin. His work emphasizes contextualized and localized experiences and knowledge for transformation. This arises from concerns that the sustainability debate is disconnected from those affected while primarily dominated by science and policy. "*There will be no 'sustainability' without a greater potential for citizens to*

take control of their own lives, health, and environment" (Irwin, 1995, p. 7). In realizing this goal, the literature encourages asking questions about participation patterns of who participates, how, and why (Eitzel et al., 2017; Gunnell et al., 2021; Sauermann et al., 2020). At this point, other concepts, such as *islandness* and feminist perspectives, were drawn upon to explore these topics in-depth.

The concept of *Islandness*, as described in chapter 2.1.2, revolves around identities shaped by island life. This concept will be mobilized in this research to look at the identities of actors involved in the project planning or as citizens taking part in CS activities. It should account for different world views and experiences on the island without being informed about the perceptions or opinions of those groups through qualitative data. *Islandness*, in the case of Samothraki, entails critical reflection on how islanders are reproduced through research. Furthermore, it means not assigning specific attributes but instead emphasizing their relationship to their place. This includes consideration of possible non-harmonious coexistence in the community (Kallis et al., 2022; Nimführ et al., 2021). This non-harmonious coexistence, in the case of Samothraki, relates to the question of who had the authority to be involved in the research process and whose participation was considered valuable. It is important to address this as challenges have developed over time in the local community and certain groups might have perceived barriers for participation.

As the overall research paradigm, a feminist approach informs this master thesis. Central concepts come from Feminist Political Ecology (FPE). FPE, as a style of research rather than a theory, emphasizes "research and practice that empowers and promotes social and ecological transformation for women and other marginalized groups" (Elmhirst, 2018, p. 1). Environmental change is understood as a process of political action, and within this process, the question of who has the power to participate in decision-making processes is examined (Elmhirst, 2018).

Recurring themes and elements of Feminist Political Ecology emerge in the literature around power and politics, knowledge, intersectionality, and everyday practices, while critically reflecting on neoliberalism, capitalism, and patriarchy (Clement et al., 2019; Elmhirst, 2015; Harcourt, 2017; Sundberg, 2016; van den Berg, 2018; Wichterich, 2015). Rigid definitions of those elements are, however, unavailable. Rather than proposing a theoretical framework, practitioners demonstrate a way to conduct research by focusing on groups that are often ignored. In the context of this work, this means being attentive to gender structures and rural livelihoods. Intersectionality, power, and knowledge are understood as an approach to address dimensions of social difference, agency, and hierarchy. Gender hereby only represents one of many forms of social differences. Different lived realities emerge from how axes of power like gender, class, and race intersect (Elmhirst, 2015, p. 62).

To gain a deeper understanding of the process, sub-research questions were developed. Within these questions, the concepts presented above are applied. The questions focus on asking:

(I.I) how did the collaboration come about?

(I.II) how did the collaboration develop over time?

(I.III) what were perceived challenges met during the process?

(I.IV) what outcomes or impacts could be observed in the process?

To unpack the process of the citizen science project on Samothraki sub-research question (I.I) asks how the collaboration came about. This notion is a central part of the manifestation of the citizen science project on Samothraki, which evolved from citizens' efforts to take responsibility and care for their community. Followed by asking the sub-research question (I.II) how the collaboration developed over time represents attention to changing power relations and making space for differentiated experiences.

Participation patterns are examined to answer the sub-research question (I.III) about perceived challenges. This stems from the suggestion that the success of co-created projects will depend to a large extent on the quality of participation in the project (Gunnell et al., 2021). Generally, participation is widely recognized in the literature as a key challenge and relevant in order to achieve democratic action (Froeling et al., 2021). Overall the interest lies in outlining the knowledge captured and its priorities.

Lastly, perceptions about lessons learned will be presented by engaging with the question of outcomes in the sub-research question (I.IV). However, learning is seen as an individual-dependent process, relying on many factors. Community learning has been described as even more complicated (Golumbic et al., 2021). Engaging with this question is thus not done to provide a systemic account of the learning but rather is concerned with how different learning can occur within the same project.

3. Research design

To outline the research design in this thesis, this chapter provides a more detailed explanation of the applied methodology. The first part briefly summarizes the research process and how the thesis evolved from an idea to answering the research questions. The next step describes the research setting, the island of Samothraki, based on a Sustainable Livelihoods Framework (SLF). In this part, the relevant context of the island is summarized. It then outlines how the methods were applied and the data collected. Finally, this research's limitations and the researcher's role are presented.

3.1 Research process

To illustrate the development of this research over time and to depict the underlying streams of thought, this process is illustrated in figure (2). The figure represents a simplified rendition of this process, as the topic and subsequent research question developed only during the fieldwork.

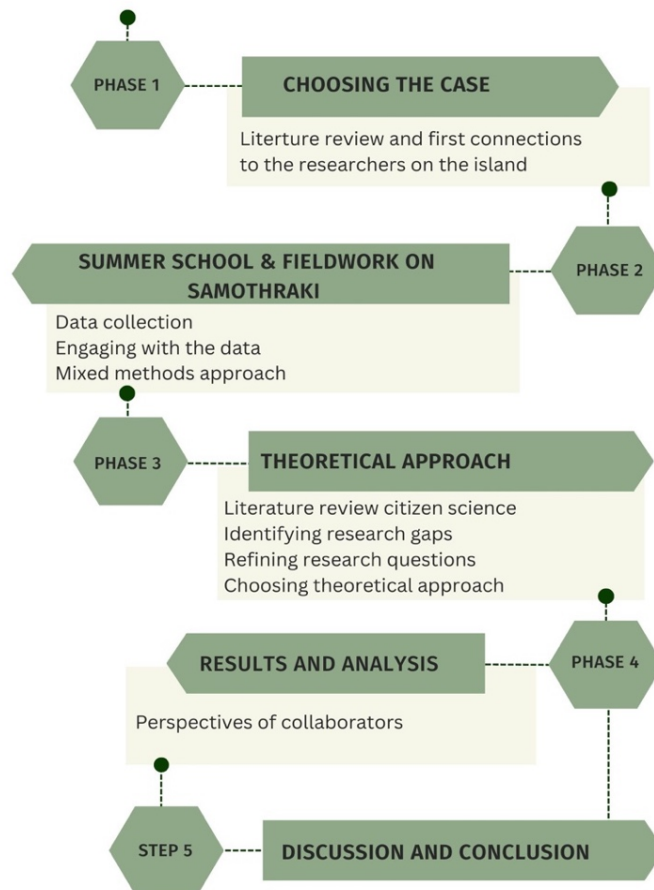


Figure 2: Visualized research process (Source: the author)

An assignment inspired the initial topic exploration in the course 'Food, Gender, and Natural Resources.' In the assignment, existing long-term research on the island was examined from a feminist perspective and related elements such as neoliberal development, knowledge, and power. Given this starting point, a broad field of interest was explored, leading to an initial literature review on sustainable development and islands. This starting point then led to the choice of Samothraki as the case study. This was followed by initial contacts with researchers active in the research on the island and an application to participate in the upcoming summer school.

During the summer school and due to the interaction with researchers and local actors, the citizen science project was chosen as the research interest. The theoretical approach was, therefore, only developed during and after the fieldwork. The months after the fieldwork were finally dedicated to this research's analysis and writing.

3.2 Research setting

The research setting was reviewed through a Sustainable Livelihoods Framework depicted in figure (3) before visiting the island (Chambers et al., 1991; Department for International Development, 1999; Scoones, 1998).

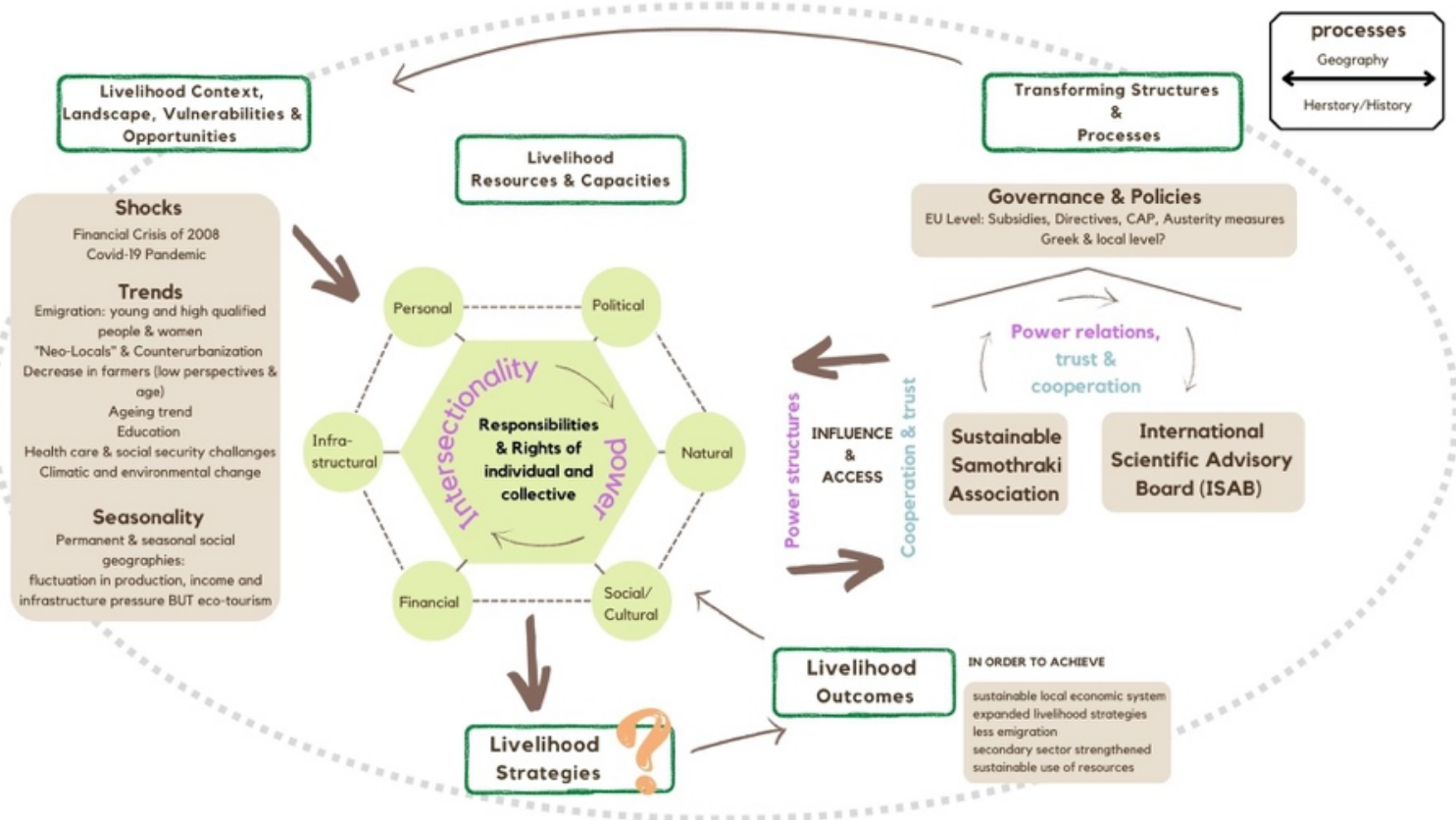


Figure 3: Sustainable Livelihoods Framework adapted from (Chambers et al., 1991; Department for International Development, 1999; Fischer-Kowalski et al., 2011; Laeis et al., 2016; Natarajan et al., 2022; Scoones, 1998, 2009)

It proved as a helpful tool to visualize relevant actors, background information, and connections on the island, which was derived from the multi-year study on the island. On the one hand, this approach was inspired by adaptations and applications in other fields (Laeis et al., 2016; Nkobou et al., 2022), and on the other hand, by the already existing model of social-ecological systems from the island (Fischer-Kowalski et al., 2020).

The left-hand side of the framework about *livelihood context, landscape, vulnerabilities & opportunities* addresses the context that directly affects livelihoods. Shocks, trends, and seasonal fluctuations form the core that individual action cannot change. Impacts from those, however, are not felt uniformly across society, and some groups may be more exposed than others (Department for International Development, 1999; Scoones, 2009). The suggestion to broaden the vulnerability context to a richer understanding of influences and opportunities comes from Natarajan et al. (2022), who added this perspective. Starting from the top, the 2008/09 financial crisis severely impacted Greece: the country lost 26% of its GDP, unemployment rose to 27.5%, and youth unemployment surpassed 50% [reference years

2013 and 2016]. Since then, there has been a reference to job insecurity in Greece. This could contribute to an emigration trend, especially of young and highly qualified people from the labor market searching for new opportunities elsewhere (Papadopoulos et al., 2020). In addition, women (in all age groups) appear to leave the island in greater numbers, as there is a 56% majority of men on the island (reference year 2011) (Fischer-Kowalski et al., 2011).

However, counter-urbanization trends in recent years also attract people to migrate to the island. As recent studies indicated, rural areas are considered more resilient than urban areas in times of crisis and seemingly lead to increased attractiveness of more remote lifestyles (Papadopoulos et al., 2020). The research on Samothraki refers to those moving to the island as "*neo-locals*," describing a group of people who have chosen to live on the island but were not necessarily born there (Fischer-Kowalski et al., 2020). Characteristics of those deciding to move to the island were described as possessing a higher education, open-mindedness to alternative development pathways, and an innovative mindset (Fischer-Kowalski et al., 2011, 2020).

The covid-19 pandemic has again hit the Greek economy harder compared to other EU countries, where the risk of poverty remains among the highest in the EU (European Commission, 2022). Interviews conducted on the island in 2013 with people of different age groups and backgrounds indicate that islanders have major concerns about the healthcare system (Fischer et al., 2013). Although there is a health center in Chora on the island, it lacks specialists (e.g., geriatricians, pediatricians, surgeons, etc.). The nearest hospital is in Alexandroupoli, which can only be reached by ferry in 2 hours. The lack of nursing homes and an increasingly weak pension system worsen the prospects for the elderly on the island (Fischer et al., 2013). In conjunction with the global trend of an aging society, challenges around health care are emerging for the future, which became particularly apparent during the pandemic (Fischer et al., 2013).

Another trend worth mentioning is the decline of people employed in the primary sector. This is often associated with age, low prospects, and incomes related to this sector. This is reflected in a finding by (Noll et al., 2020), according to which half of the traditional farms have disappeared between 1970 and 2016. Finally, environmental and long-term trends such as climate change must also be considered. Extreme weather events leave the island vulnerable, as demonstrated by a flood event in 2017 (Fischer-Kowalski et al., 2020). Higher temperatures, sea level rise, reduced precipitation, and more wildfires are all climate change impacts that will most likely increase in the future. In addition to the primary sector, this could also have a negative effect on tourism on the island (IPCC, 2021).

With around 40,000 tourists annually, seasonal fluctuations can be observed on the island. This puts the island under heavy pressure in terms of supply during the high season. At the same time, it represents a significant economic income for inhabitants during the summer months while offering underutilized opportunities to attract visitors the rest of the year (Chertow et al., 2019). The island is often described as a rare remote island rich in natural

endowments and off mass tourism, which as elaborated above, gives grounds to challenges as well as opportunities.

On the right-hand side of the framework, the *transforming structures & processes* refer to relevant actors, policies, and bigger structural components decisive in transformations (Department for International Development, 1999; Scoones, 2009). At this point of research (before the fieldwork), it was unclear which actors were still active on the island, as the last reliable insights were from before the Corona pandemic, i.e., two years old. Governance structures influencing action on the island were identified as directives, subsidies, and austerity measures coming from the EU. Policies on the Greek level, as well as local level, were mentioned. However, unclear at the time what role they play. This information was partly extracted from the island literature and the Sustainable Samothraki website (Fischer-Kowalski et al., 2020; *Sustainable Samothraki*, n.d.). Only through the summer school, interviews, and informal conversations throughout the stay in Samothraki did the history of the association unfold. Researchers in the framework are represented through the International Scientific Advisory Board for the SUSAs.

By 2016, the Sustainable Samothraki Association (SUSA) was officially registered as an association and started functioning with 29 founding members⁴. In 2016, a milestone meeting took place with the researchers, the SUSA, and involved students in Vienna. Discussing aims and further plans of the collaboration. This was followed by activities co-organized and planned by researchers and local actors.

3.3 Methods and data collection

3.3.1 Qualitative research approach

This study is based on a qualitative research approach. In environmental research, this approach is advantageous because it allows for comprehensive and holistic descriptions beyond numerical assessment. This is relevant since environmental challenges involve a vast range of knowledge, resulting in a broad spectrum of questions (Rastilantie et al., 2011). Conducting a case study was not seen as a methodological choice but simply resulted from choosing Samothraki as the focus of this investigation. Through this selection, it was clear that several sources of information were relevant for detailed, in-depth descriptions of this case and for identifying relevant angles and actors (Creswell, 2013). While the case study was initially broad, the qualitative research approach and related fieldwork helped narrow the scope further.

Overall, the qualitative research approach proved valuable, as the context was first examined before the specific research topic was determined. This allowed for a relevant and timely selection of the topic. The use of mixed methods within this approach made it possible to

⁴ As apparent through the statue of the association

examine the case from various perspectives, allowing essential nuances, such as power relations, to be identified. Despite acknowledged weaknesses, such as coping with a large amount of data or the lack of a clear structure (Rastilantie et al., 2011), qualitative inquiry ultimately provided the opportunity to adapt the research design to the real-world context on the island and stay flexible about evolving new insights.

3.3.2 Summer School

Entry to the field and the possibility to get to know relevant actors on the island was achieved through the Summer School "*Guiding a local transition of the society-nature relations on the island of Samothraki*." The Summer School took place from July 15th to 24th and provided the opportunity of being introduced to numerous actors, in addition to interviewing them as part of the course. After a two-year break, due to Corona, the Summer School took place for the 7th time on the island. The 21 students were accommodated during the 10-day stay at the *Varades* campsite, which is run by a social cooperative. The summer school was organized in the framework of a cooperation between four universities⁵ from Greece, Austria, the Czech Republic, and the Hellenic Center for Marine Research. Erasmus funded the summer school.

The first day of the summer school started with scientists reporting on the approaches used and the findings of the project "sustainable Samothraki" so far. Among them was the project leader Marina Fischer Kowalski - who established the research on the island in 2007 and coordinated it throughout the years. Then, as now, she is supported by a research team consisting of several scientists. Significant contribution came especially from PhD students conducting their research on the island over the years.

The participating 21 students were then divided into three smaller groups on the following days. These consisted of Module 1: Bottom-up Citizen Initiatives for Sustainability, Module 2: Securing the Island's Freshwater Resources, and Module 3: Island Circular Economy - Social Transformation Potentials for More Circular Resource Use. As part of the first module, a total of 8 students explored the role of civil society in sustainable transformation processes on the island with the help of the project lead Marina Fischer Kowalski and Simron Singh, who supported the group as tutors.

Semi-structured interviews and narrative interviews were chosen as a method to explore the mentioned topic. In groups of 2 to 3 people, 23 interviews were conducted between July 17th and 22nd with different groups of local stakeholders. These actors were categorized into (former) politicians, activists, (sympathizing) entrepreneurs, and researchers. At the beginning of the module, a list of stakeholders known to the researchers, containing 42 contacts, was provided. The module participants contacted these people by phone or e-mail and organized interview appointments together. The tutors asked only political actors, such as the mayor,

⁵ Democritus University of Thrace, University of Natural Resources and Life Sciences (BOKU), University of Vienna, Brno University of Technology

for an appointment. The students organized themselves to have an interviewer, another person who took notes during the interview, called "metadata," and one who listened and thought about some concluding questions. The interviews lasted, on average, 45 minutes. In several interviews, translators were organized to circumvent the language barrier. The interviews were all recorded with the consent of the participants. The diversity of the interviewees led to very different interview questions, which were designed flexibly from the beginning. Reoccurring questions were, for example, whether they could tell something about themselves, what sustainability means to them, and whether and how this person is or was active on the island. A total of 3 interviews were conducted via zoom, and the rest were in randomly selected locations, such as an old school in Therma, which was made available to the summer school, cafes, or the village square in Chora.

On Saturday, May 23rd, students met with their tutors in their groups to discuss how to present the data they had collected over the past few days. The students then worked individually in their groups on their own results and considered how they should be analyzed and presented. The following day, all three groups presented their results at the old elementary school in Therma. The event was open to anyone interested. The audience mainly consisted of researchers, students, and a few local actors participating in interviews. Finally, all summer school participants met for the last reflection session that day.



Figure 4: picture on the left: group meeting of module one. Top right: cafe owner and staff after an interview together. Bottom right: module one in Chora after interviews. (Source: pictures from Lennard Schweer and the author)

3.3.3 Key Informant Interviews

Key informant interviews are presented in the literature as a method to enter research. They are described as a helpful method for exploratory purposes to identify relevant actors and knowledge for process understanding and to proceed with further qualitative methods (Shackleton et al., 2022)

During the fieldwork, two of those interviews were held. The informal nature of the interviews was deemed necessary to establish a more intimate relationship with the interviewees outside the course's organized scope. It was also an opportunity to gather additional information and ask questions that arose during the first weeks on the island. The interviews also gave space to talk to participants more openly and provided room for them to voice opinions, which helped to understand which aspects should be considered in the research process. As mentioned by (Shackleton et al., 2022), it was also an opportunity to build trust and rapport with the participants, which proved to be helpful throughout the stay. Both participants, of Greek origin, ultimately contributed to a better understanding of the context and influenced the direction of the research. Both conversations were recorded with consent to be able to review them at a later point. The conversations lasted 1:15 and 2 hours.

3.3.4 Semi-Structured Interviews

Qualitative interviews, as highlighted in the literature, are useful for exploring opinions, feelings, and a variety of experiences. Semi-structured interviews are described as “conversational and informal in tone”, thus they are considered suitable for reconstruction of respective experiences of the actors involved (Longhurst, 2010, p. 105). In addition, Rubin and Rubin describe that it can help understand processes of how and why things change (Rubin et al., 2005). Within a feminist theory framework, this method is furthermore used as a tool to examine power relations embedded in social patterns (Longhurst, 2010). With this background, semi-structured interviews were considered the most appropriate method to ask involved actors about the CS approach and their perception of it.

An interview guide helped considering relevant questions while remaining open to the experiences that interviewees felt were important (Longhurst, 2010). The guide was not seen as a rigid structure but rather as an orientation. The structure of the interview guide (available in annex 1) was based on the research questions. In addition, it was informed by principles of Feminist Political Ecology, such as decision-making processes, position, and hierarchies, as stated in 2.2, *theoretical framing* (Elmhirst, 2015). Additionally, CS literature was used to prepare the interview guide (Sauermann et al., 2020). The introductory question was designed so that the participants first talked about the initiation of the research from their point of view. These narratives were then built upon and served as the basis for the rest of the interview. Each interview was, therefore, different and changed depending on what the interviewees felt was important. After the interviews were conducted on the island, the guide

was adapted for the upcoming interviews with researchers in order to gather missing information about the project design.

Interviewees were selected based on their experience in the CS process. These were actors who were actively involved in this CS process during the time period chosen. Insights into who should be considered knowledgeable about the CS process mainly came from the summer school participation. Re-listening to interviews from that week helped choose interview partners who should be contacted. The key informant interviews supported this selection and pointed to missing actors. Individuals who did not speak English had to be excluded from this selection because there were no financial means for translators. A total of 7 local actors were contacted, 4 of whom agreed to be interviewed. Despite prior personal contacts and commitments for an interview, it proved challenging to reach out to those individuals and convince them to participate. This can be explained partly by the peak tourist season when most of the island is busy and generates a large portion of the annual revenue. These four interviews were conducted during the stay on the island in different locations, one of them online via Zoom. The interviews with the researchers were conducted after the fieldwork on the island: one online and one in Vienna. The average interview duration was 80 minutes, with the shortest interview lasting 50 minutes and the most extended 1 hour and 50 minutes (details available in annex 4).

3.3.5 Observations

Participant observation is generally understood as a process that enables a better understanding of the daily life and activities of the actors of interest. This qualitative method is widely used in anthropology and originates in studying indigenous communities to gain insights into their lived realities (Kawulich, 2005). Participant observation was chosen as a method of data generation to get an overview of the reality of life on the island as an outsider. Since access to the field was established by outsiders (the researchers), this method was considered particularly important for gaining insights. It was also essential to see the research team as part of the observations to understand what role they held. Another reason for using this method, as Kawulich mentions, was to build relationships with the islanders in order to gain a better cultural understanding. Furthermore, this was necessary to understand which research questions were meaningful (Kawulich, 2005).

The observations were conducted randomly and adapted to daily life on the island. Observations were done using the principle of descriptive observation, where everything was observed without pre-determining what was important and what was not, on the assumption that everything could be of value (Kawulich, 2005). The field notes were written based on daily reflections. *Table (1)* shows one example of this reflection. Mostly, the notes were written by hand during the day and transferred to this table in the evening or the next day.

Wednesday, 17. August 2022

Descriptions	Primary reflection	Process reflection	Personal reflection	New plans & ideas
Went to Kamariotissa to print the interview documents. Started talking to the owner. We talked about his thesis on waste management on Samothraki. Went to Chora to work and pumped into T. Offered to help them as a waitress for them to be able to keep the café open. Worked at Lefkos Pyrgos and had a chat with G. about the summer school findings. Contacted ... again for interviews. No responses or fixed scheduled interviews.	Everyone is overworked and almost burned out because there is a lot to do on the island. More and more tourists arrive. Some people told me they hardly have time to sleep. T. was more than happy to take my offer, since she seemed very desperate about her situation. She told me her family depends on the income from this months.	Going around the island working and talking to different people helps a lot and interesting and valuable insights always arise from those conversations. It will be interesting to help in the Café on the weekend and get to know and talk to more people. Trying to arrange interviews in a very inconvenient time for everyone as it seems!	Personal frustration with not being able to shedule any interviews. It makes me feel like I am adding to people's workload thus feeling insecure at times. Thinking about working at the café helps a lot, gives me a feeling of belonging.	Have another chat with the owner of the print shop, keep working at different locations on the island and talk to people. Offer interview partners to help them in return for an interview.

Table 1: Daily reflections example (Source: the author)

3.3.6 Data Analysis

The data analysis process was not separable from data collection but took place as an iterative process after the fieldwork was completed (Rastilantie et al., 2011). Thoughts and reflections regarding the analysis already took place during the fieldwork, alongside the ongoing process of transcribing interviews. The chosen method for the data analysis was thematic analysis. The reason for this lies in the strengths of this type of analysis to illuminate different perspectives and to emphasize both differences and similarities as well as other unexpected observations in the data (Nowell et al., 2017). The procedure was guided by the 6 phases of a thematic analysis by Nowell et al. (2017). The first step in terms of the aforementioned phases was familiarization with the data, which began in the field and lasted until after the stay on the island. This phase included transcribing interviews and archiving different sorts of data, thus creating a general structure for the data to be used. Secondly, actively engaging with the data entailed re-reading transcribed interviews several times, listening to the key informant interviews, and going through the daily reflections. Subsequently, to identify relevant information from the summer school interviews, metadata was explored from 11 interviews containing information about the personal involvement of the local actors. Interviews, which seemed to hold relevant information about the collaboration between the actors on the CS approach, were then transcribed with the help of the transcription platform Konch. During this phase, broader ideas were reflected, and initial themes were already thought of. Thus, phase 2 (generating initial codes) and 3 (searching for themes) can be described as intertwined. Hereby an inductive approach was used to generate initial codes. Those steps

were done with the help of the software program NVivo. The last phase was number 5: defining and naming themes, and 6: producing the report.

3.4 Ethical aspects

To comply with ethical principles and with the intention of positively influencing the process and trust within the interview, an information sheet and informed consent was prepared for the participants (Shackleton et al., 2022). The information sheet outlined the research goals and how the interviews were to be utilized (available in annex 2). A written informed consent was obtained to ensure that participants understood the terms of the participation (available in annex 3). This included, for example, the right to withdraw what was said in the interview without any explanation or reasoning and the contact information of the concerned researchers. This step was considered essential to ensure the transparency of the data collection on the one hand and to establish a base of trust in the interview situation on the other hand (Shackleton et al., 2022).

3.5 Positionality statement

In the context of this research, it is necessary to reflect on my positionality during the fieldwork on Samothraki. Positionality describes the researcher's worldview and position in the context of the research being conducted. Positionality includes both relatively fixed positions such as gender, age, nationality, and ethnicity as well as somewhat flexible ones such as political views and experiences. It is crucial to recognize that research cannot be value-free and that the researcher's positioning influences the way the research is conducted and its results (Holmes et al., 2020).

First, I would like to discuss the context of the research project in which the field research was largely embedded. Even though I did not write my thesis at the Institute of Social Ecology (SEC) at BOKU, the study was built on the support of the researchers within the institute. This is important because it can be viewed as a connection point between myself, the researchers, and their previous projects on the island. This brought benefits, such as more accessible acquaintance with actors involved in the past with the topic I was interested in and generally easier access to information. However, this likely influenced how open participants felt talking about the researchers. This assumption stems from the background that, first, the interviews during the summer schools were sometimes conducted with the participation of the research project leader, who often also took on the role of interviewer. Second, because the relationship between the researchers and participants was often described as friendly, there is a presumption that respondents did not always openly express their opinions about possible discontents or power imbalances.

Secondly, it is necessary to reflect on my position as an outsider and, again, study islands with this perspective (Nimführ et al., 2021). My educational background, foreign status, and language barriers could have influenced creating versions of *islandness* that islanders

themselves might disagree with. Being an outsider on the island, language barriers, as well as being associated with researchers from Vienna, hindered my ability to talk to particular groups that could have voiced such disagreements. Interviews ultimately were restricted to people with similar worldviews and educational backgrounds, limiting the diversity of reflections and perceptions about the research.

3.6 Limitations

As mentioned above, the study may have limitations due to the small number of interviews with local actors on the island compared to those involved in the entire CS project. In addition, it should be emphasized that interviews were conducted with individuals who were sympathetic to the research project and who had also developed a personal relationship with the researchers over the years. However, a higher number of participants, which would have allowed for a more differentiated perspective, was not possible from my point of view, as there were already limitations with this small number of interview partners. Among the most significant limitations was the language barrier between the interviewer and interviewee. While many residents speak English, people who speak only Greek had to be disregarded as early as in the phase of contacting potential interview partners. In addition, the outsider effect of not being of Greek origin made it difficult to establish contact with some residents. Language, furthermore, might have hindered interview partners in expressing themselves during the interviews.

Moreover, challenges arose from seasonal aspects, as the second half of the fieldwork coincided with the island's high season, giving people few opportunities to participate in an interview. A prolonged period in the field could have remedied the situation in some cases, especially since fewer tourists were on the island at the end of the fieldwork. Therefore the work pressure on the local population slowly decreased again. However, this research is also subject to a certain time pressure, which, combined with low financial constraints since the field stay was financed with personal funds, did not make it possible to stay longer.

Finally, the stated positionality influenced not only the data collection but also the data analysis. As a result, data analysis was guided by subjective interpretations of what was heard and observed. The mixed-methods approach was intended to remedy this by gathering broad perceptions and experiences.

4. Results

In this chapter, the collected data will be analyzed to investigate the overarching research question about the process of the CS project. As a first step, the beginnings of the CS project are scrutinized in 4.1, aligning with sub-research question one. The research phase before the CS project is emphasized as a prerequisite and thus elaborated on. The section states objectives on how CS was sought to be applied. Furthermore, how the SUSA was established and defined in this process. Chapter 4.2. revolves around the implementation of the CS

approach in co-organized activities. Adapted roles in those activities are furthermore presented. Section 4.4 then presents participation patterns in the CS project, and associated challenges and barriers are identified for diverse participation. Identities that are present and influence participation patterns are elaborated on. Finally, section 4.5 outlines outcomes and lessons learned.

4.1 The foundations for the collaboration between local actors and researchers between 2007 and 2016 and reflections on the Citizen Science approach

As stated in research publications and confirmed by the semi-structured interviews, researchers considered the project scope a bottom-up process (Petridis et al., 2017) (researcher #1, #2, #3). On the one hand, this is justified by the emergence of the research on the island through the initial contact of the local initiative "Samothraki in Action" with the project lead. In the interview, she described being approached by this group, consisting almost exclusively of young women, raising health and environmental concerns about waste incineration on the island (researcher #3). The NGO was described in documents for the application to the UNESCO MAB as being active in public awareness raising and environmental education. After initial discussions and meetings with this group, she described a perceived desire and commitment from them to protect the island. This was cited as part of the departure for initiating a research project on the island to support those efforts (researcher #3)(Petridis, 2016). The project lead, at the time being part of the UNESCO Man and Biosphere Committee in Austria, as she elaborates further in the interview, identified the Biosphere Reserve (BR) concept as a way to pursue a sustainable development pathway for the island (researcher #3)(Petridis, 2016).

Adding to the above, this way of designation was explained in research outputs as another manifestation of the bottom-up approach. This unfolded in a series of "explorative and visioning focus groups" with local interest groups (Petridis, 2017, p. 17). This resulted in a reported wide range of positive feedback from stakeholders on the island. As mentioned in section 2.1.4 (p.15), *previous research on Samothraki*, semi-structured interviews indicate opposition to this idea by livestock farmers, as they feared losing land⁶. Findings from a 2013 focus group with farmers (10 male and 1 female farmer) describe them as generally critical of new ideas and solutions for several reasons. It is pointed out that they are too old to change (a statement from a farmer). In addition, they have had bad experiences in the past with cooperation partners who have abused their power for political and socioeconomic gain, which has led to political fatigue and general distrust among farmers. The authors point out that they did not ask farmers for their opinions about the BR reserve because of their sensitive situation and livelihood concerns. Adding that further discussions with this group should be encouraged to talk about possible marketing strategies of the farmers, thus hoping to increase

⁶ This critical attitude towards such a vision by farmers is not addressed in the published papers. A reference to it can only be found in the MAB application.

their incomes (Fischer et al., 2013, p. 18).

This first explorative phase and initial contacts with local actors were described as instrumental in generating a knowledge base for the research project (researcher #1, #3). Various actors and organizations helped the researchers obtain and interpret data. A researcher portrayed this time, responding to the question of how everything started like this: *"I think, yeah, we have been, especially in the first years, we have been listening more than... than imposing, we did this two large rounds of focus group interviews 2012 and 14 with various stakeholder groups"* (Researcher #1). This phase, which preceded the CS project, lasted nine years, from 2007 to 2016.

These nine years can be seen as the basis for the CS project. Although no explicit reference is made to the typology of this CS project, co-created project characteristics were intended. As can be seen from this description: *"The goal is active participation of all sides at each stage of the process, from problem definition and data generation to agenda setting and interpretation of results [...]"* (Petridis et al., 2017, p. 124). Furthermore, plans for how to implement the co-created CS approach can be found in this statement: *"In order to substantiate collaboration between scientists and the local community, further involve local citizens, co-define research questions, understand the challenges ahead, find a shared vision, and learn to apply specific research methods [...]"* (Petridis et al., 2017, p. 123).

Examining the researcher's stated intentions in comparison to practical implementation first requires a review of the overall research objectives. As stated above and confirmed in the interviews, the BR concept was seen as an overarching vision to define and adopt a sustainable development pathway for the island (researchers #1, #2, #3, local actors #3, #4). The research, precisely the CS approach, aims to empower the local community to engage in sustainability efforts and carry those on through *"joint goal development, vision, and process ownership"* (Petridis et al., 2017, p. 124).

It is argued that the research team already pre-defined the overall vision for the island. This assumption is supported by a local actor making reservations about the MAB concept applied: *"hmmm... for me, I feel that for sure, you know, the goal of MAB, it was something that was imposed, it was something that came from outside, it was nothing that came from inside, meaning that it came from Austria, from the scientists and it didn't come from the local community. So it came from the scientists, it landed on our heads (short break), it was a great idea.. probably, but it was not our idea. And so we didn't exactly know what this is, because it came from above, so it was again [...] a bottom-down situation"* (local actor #2). In continuation of this, critical reflections by one of the researchers who was involved in the beginnings point to the *"dominance of scientists in framing objectives"* as well as potential unbalanced problem ownership in this phase (Petridis, 2017, p. 14).

Concerning the intentions to *"further involve local citizens"* (Petridis et al., 2017, p. 123), references can be found that local actors co-organized the stated above focus group

discussions. On the one hand, "Samothraki in Action" supported them, next to those who later founded the SUSA (Petridis, 2017). Finally, many interviews with local actors reflected the period from early intentions to setting up the association to the formal creation of SUSA in 2016. They recalled this time as intense in terms of *"education, collaboration, networking and small actions of several things"* (local actor #4). Educational activities included trips for selected members to UNESCO MAB-related events to learn about and understand the principles on which it is built. Concerns were raised in the interviews that this period, specifically the selection of who to send, was not always perceived as based on consensus and was coupled with internal communication difficulties (local actor #2) - suggesting unequal power relations within the SUSA.

Mentions of a 'milestone meeting' in Vienna with the researchers, the SUSA, and some students took place in 2016 (*SUSAKI/CISCISUSAKI Milestone Meeting Report*, 2016). The meeting revolved around future strategic priorities, such as the aims of the collaboration between the SUSA and the researcher and how this collaboration should unfold. This meeting was described as the only reflection organized and conducted between all actors involved in the research process. Feedback meetings took place on the island in 2017 and 2018, however, in a relatively informal way (researcher #1).

The SUSA was then framed to ensure collaboration between the researchers and the local community. Citizens engaged in the SUSA were intended to support the process in several ways, firstly, by co-defining research questions, ensure the buy-in of the local community and elaborate on shared visions (Petridis, 2017). Co-defining research questions were perceived by one actor as follows: *"so we could also have our say in some aspects of the research, okay it was designed in a way, but we were involved in a part of this"* (local actor #3).

Ensuring the buy-in of the local community then was perceived similarly by the local actors, as is reflected in the following statement: *"The aim of the association – I think first priority... for us and also for the scientists was to, to create a (tries to find words) kind of a link between the local community and the scientists. To be (thinks for a bit) the association, to be in the middle, of these two so a dialog, a communication could start between all stakeholders, between all parts. I think that was the first, let's say (thinks) aim for this association (local actor #2)"*.

The 9 years of socioecological research from 2007 to 2016 were finally highlighted as a prerequisite for the CS project. During this time, the first contacts were made with local collaborators. Furthermore, a transdisciplinary research evolved, involving a variety of different scientific researchers as well as Greek partners. Within this period, the SUSA was established and its role in the CS project was defined and negotiated between researchers and the founding members. The association was officially registered by 2016 and started acting as such. In the CiSciSusaki project (Citizen Science Sustainable Samothraki) that followed from 2016 to 2018 the SUSA was then defined as bridging the socioecological research and the local community. A variety of roles within the research process and beyond

were adopted by the association. These roles are described through the jointly organized activities between the SUSA and the researchers. Other actors relevant in this context will be elaborated on and their role in the collaboration in 4.2.

4.2 Citizen Science activities between 2016 and 2018 and adopted roles

Implementing the citizen science approach was ultimately visible in jointly created activities. In interviews, the yearly summer schools were highlighted by both actors as an instrumental setting for developing and implementing the activities and the CS approach. To analyze the applied initiatives and relate them to the overall process, the activities and the different roles that the actors had in them are presented in *figure (5)*. Actors in this context are researchers, the SUSA, the municipality, and citizens. For completeness, the International Scientific Advisory Board (ISAB) is listed as an actor. According to the statute of the association, the board is elected by the board of the association and consists of 5-7 members of the international research community, 2 of whom must be of Greek origin. This board has no voting rights in the association and an obligation to submit an annual report on sustainable development issues on the island. This should include proposals for solutions to these problems. Whereby this opinion is not binding for the association. Although it still exists, its role in the CS process was estimated to be minor. Role descriptions for the actors are adapted from (Göbel et al., 2021, p. 342) for the first three. Intermediary role is adapted from (Petridis, 2017, p. 14) and the statute of the association. The supporter role evolved through own observations and impressions from the interviews:

- **Technical role:** knowledge production through collecting data and interpreting data;
- **Governance role:** organizing research activities and identification of relevant local issues;
- **Advocacy role:** implementing transformative knowledge in the local community; bridging research and local community
- **Scientific advisor role:** *“raise funding for research on the island, help building networks of interested researchers, organize scientific excursions and workshops, support Samothraki Biosphere Reserve in linking into existing networks of sustainable island initiatives and help with reviewing research proposals and publications.”* (Samothraki Biosphere Reserve Nomination Form, 2013, p. 20);
- **Supporter role:** support for activities such as providing cars and providing a platform to present results.

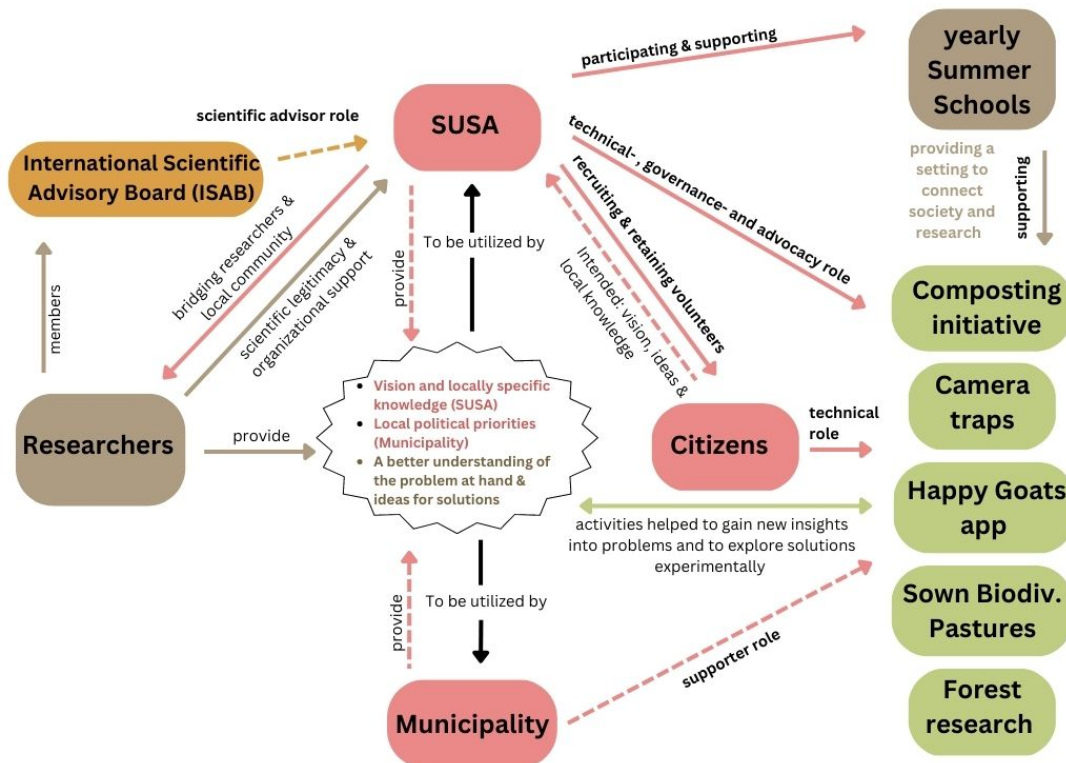


Figure 5: Actors in the CS activities. Red actors represent the local level, brown actors represent the 'outsider' level. Dotted lines represent minor roles. Centre circle represents ideas and adapted roles for finding solutions. (Source: the author, centre circle adapted from Petridis, 2017).

Starting from the top right, the first **summer school** took place in 2012 and was held annually from 2014 to 2019. Researchers perceived the summer school as a possibility for students to explore social-ecological and participatory methods (researcher #2, #3). In addition, it has been recognized as giving support and strength to local initiatives and contributing findings to the regional development agenda. Increased visibility was gained through public presentations of the results of each summer school. Interviews furthermore point to the common practice of members of the SUSAs participating in them and facilitating a connection to the local community by co-organizing field trips, for example. Both researchers and local stakeholders perceived the summer school as providing an opportunity to link science and society, thus strengthening their relationship (local actor #2, local actor #3, local actor #4, researcher #2, researcher #3). Finally, the summer school contributed data to the overall research project (Petridis, 2017) (researcher #3). As part of the 7th summer school from the 15th to the 24th of July, valuable insights were gained. As one Greek student noted in the final reflection session, one perceived challenge was that almost exclusively non-Greek students participated in the summer school. Therefore, participants who were familiar with the Greek context seemed to be missing, often resulting in a different understanding of the procedures and cultural perception. On the other hand, this can lead to new insights and a fresh perspective from outside.

The **composting initiative** 'Nature's Way of Recycling' reportedly developed because of findings from the 3rd summer school about waste composition (Noll et al., 2016). The SUSA accompanied this research project with the Greek civil society organization Re:think, which jointly provided and administered compost garbage containers for two schools on Samothraki (Sustainable Samothraki, n.d.). Furthermore, as indicated in an interview, the SUSA pursued a composting project by the municipality and the region of East Macedonia and Trace, distributing compost bins to individuals in the community on the island. On another level, questions were asked to those citizens participating about their experience and how they did it, interpreting those results at a later stage (local actor #3). As the project leader framed it: *"That was kind of stimulated by us, but it was done by the local initiative"* (researcher #3). SUSA is therefore seen in this project as carrying out a technical role in data collection and a governance role in organizing the research process. Finally, it had an advocacy role, raising waste management awareness and generating transformative knowledge for and with the community.

Installing **camera traps** on the island has been mentioned as another citizen science activity (SUSAKI/CISCISUSAKI Milestone Meeting Report, 2016). The first steps supposedly took place in setting them up, intended to raise awareness about the relevance of nature conservation (local actor #4). The cameras were apparently handed out to “young scholars, hunters, hikers and town hall employees – to give local community members a tool to discover their island” (Herzog et al., 2016, p. 29). Due to legal issues with the military, the project was canceled in the end and pictures were not analyzed (Fischer-Kowalski et al., n.d.).

For completeness, the **Happy Goats app**⁷ is included in this list. The activity is mentioned in several articles, but only one researcher refers to it briefly in the semi-structured interviews conducted for this study (Researcher #1). This is likely due to the fact that SUSA was not involved in the project. The app was initiated through the collaboration between a Greek IT company, Aristotle University of Thessaloniki, and the Leibniz Center for Agricultural Landscape Research. For the development of the app, which was supported by European research funds, the previous results from the semi-structured interviews and focus groups with farmers from the social-ecological research were used (Chertow et al., 2019). As a decision support tool for farmers, it was described as a way to *"improving farmer's business understanding of their own farm"* (Chertow et al., 2019, p. 7). As far as the understanding extends through the available descriptions, the app should guide farmers to make environmentally friendly decisions while demonstrating that these decisions do not compromise economic performance. Thus “creating knowledge that local farmers currently often lack” (Petridis, 2017, p. 125). The number of participating farmers was not mentioned. Through this description, however, a technical role through making data available is assumed. The results the app generated were described as instrumental in further approaching farmers

⁷ available at: <https://happygoats.eu/en/home/> [accessed 13.02.2023]

and understanding social and economic aspects of livestock farming on Samothraki (Noll et al., 2020).

Another project referred to as '**sown biodiverse pastures**' and 're-greening Samothraki' took place between 2015 and 2019. In cooperation with the Lisboa Technical University and its spin-off TerraPrima, the sown biodiverse pastures were tested on 13 plots in the first years. In this project, the SUSA, as understood through the semi-structured interviews, primarily engaged in a governance role (local actor #3). This unfolded through the management activities of the local farmers participating in the experiment with their plots. All of which were male. It was described as a challenging process throughout the years due to contrasting practices.

On the one hand, plowing practices introduced by the research project contrasted with plowing done by farmers for generations (local actor #3, researcher #1). In a way, a technical role here is presumed due to organizing and coordinating specific equipment for some farmers to adapt to this new practice (local actor #3). The advocacy role can be observed as one member of the SUSA acted as a coordinator between research and the farmer, thus holding a position of a communicator and knowledge broker (local actor #3). Furthermore, this individual has been attending the 4th summer school, presenting this project to students on a field trip, explaining and introducing the practice and science behind it (*Sustainable Samothraki*, n.d.).

The **forest project** 'On the state of oak forests' used a common CS approach to provide a scientific basis for evaluating oak stand restoration measures (*Sustainable Samothraki*, n.d.). Insights from interviews show that this was the project with the most significant number of citizens from diverse backgrounds. Members of the association too participated in collecting data. Thus, adopting a technical role. According to an interview, this project lasted several days, and participants were financially compensated for their work (Interview local actor #2). Several interviews indicate that some members organized the project so that SUSA may have had a governance role. Almost everyone interviewed pointed to the positive outcomes of this project in awareness raising and giving attention to a 'hot topic' of overgrazing without polarization (local actor #2, #3, #4).

Despite the perceived positive outcomes of the forest project, one interviewee points to a perceived missed opportunity to advance this experience even further and voices disappointment in not being given a chance to discuss the results with other participants: "*if you make a process, an educational process, not typical educational process, that you take the... the results of what you saw, not the facts, the experience of it and you put it down, and you discuss about it, and you share about it, then this... this stays, inside you. And in this group... for example, never saw the facts after [...]*" (local actor #2). The interviewee then continued that those results were presented at the end of the summer school. However, not everyone was there to see it (local actor #2).

The middle circle represents ideas and adapted roles of the actors for finding solutions. The role of SUSA was to contribute local specific knowledge about the problems and visions, as mentioned by (Petridis, 2017). The municipality provided local policy priorities for problems such as waste management, as noted in the interviews (Researcher #1, #3, Local Actor #3). The researchers subsequently provided a science-based understanding of the problems and ideas for solutions. These were to be utilized by the municipality and SUSA. Activities were aimed at addressing these problems with practical solutions in the form of activities. As described, SUSA held all three roles in the activities (technical, governance, and advocacy). However, it is unclear to what extent SUSA was then involved in specific research components such as formulating research questions and analyzing data. In addition, SUSA was responsible for volunteer recruitment and retention outside of the activities. The municipality was perceived as a supporter rather than a close collaborator in the context of these activities. This was evident in the interviews where roles such as providing vehicles and being able to present results to the local community were mentioned (local actors #3, #4, #5, researcher #1). Finally, citizens were intended to contribute to solutions indirectly with local knowledge and visions through the SUSA. Whereas the SUSA took the role of bridging the local community with the scientists. Furthermore, citizens contributed to these activities by collecting data. The various contributions to scientific output were found in all research publications in the form of mentions of SUSA in the acknowledgements. In comparison, citizen contributions were mentioned only once in one publication.

While the mentioned CS activities took place mainly during the summer, interviews indicate that the SUSA was active all year round. As noted in the statute of the SUSA, a total of ten functions of the SUSA were listed. Local actors involved thus reported many responsibilities and an overwhelming workload at some point (local actors #2, #3, #4, #5). As a result of adopting many roles, one local actor explains that the goal was lost in the process over time. *"[...] I think we lost the... the long term goal. Because there wasn't any discussion at the last four years assemblies about MAB [l:mhmm], not even the word was mentioned."* (local actor #4). In addition, reflections by (Petridis, 2017) indicate frustrations on the part of SUSA about unclear roles. However, it is not explicit whether within SUSA or in the CS process.

4.3 Participation patterns and related challenges and barriers

Challenges in the CS process were identified primarily through the interviews. Participation was the most frequently mentioned challenge among local actors and researchers overall. Participation, however, for the two actors can be interpreted differently. For the local actor's participation was framed in a way as to plan and take part in activities and further engage in the SUSA. For the researchers, on the contrary, this was instead framed as utilizing research outputs and translating them into tangible actions and responses to environmental issues by the local community.

As indicated in the literature review in section 2.1.1, aspects such as the **level of participation**, **motivation to participate**, and **diversity of involvement** (Agnello et al., 2021; Strasser et al.,

2018) are relevant topics to engage with. Asking who participated, two distinctions were drawn since two streams of involvement unfolded locally. As concluded from the activities, citizens participated solely as volunteers in the data collection. On the other side, the SUSA took part in many stages of the research process, while individuals also acted as volunteers in CS activities. Table (2) summarizes the findings regarding the two groups concerning the level of participation, motivation to participate and diversity of participation.

	Levels of participation	Motivation to participate	Diversity of participation
Citizens	Depending on the project and commitment (e.g., forest project: low commitment; biodiverse pasture project: high commitment)	Interest; financial compensation (e.g., forest project); personal gains (e.g., seeding project); sense of responsibility (composting project)	Depending on the opportunity to participate, citizens believed to be generally open and supportive towards the BR vision
Members of SUSA	Different levels of participation within the SUSA. Some individuals were highly engaged in the research process, holding many responsibilities, while others were 'members on paper.'	Interest in research and scientific methodologies; Interest in learning about sustainability; Interest in transformative knowledge and taking action	Founding members of SUSA: 20 male; 9 female Board of directors 3 male; 2 female; many with higher education

Table 2: Level, motivation and diversity of participation for citizens and members of the SUSA (Source: the author).

Through the CS activities in the previous section, volunteers from different groups were identified, e.g., farmers, children and their parents, summer school students. Overall, demographic data for the projects was not made available to make in-depth statements about who participated. While there is no qualitative data and personal reflections on the part of the volunteers to make statements about their experience of participation in CS activities, general remarks can be given. Researchers reported that the level of involvement depended on the project implemented and the volunteers' commitment (researcher #3). For example, the forest project asked for a low commitment from the volunteers, even though physical activity was involved (local actor #2). Thus, high levels of participation were reported (Interview researcher #1). Contrarily, the biodiverse pasture project required high commitment because farmers' plots had to be dedicated to the project. On a second level, they had to engage in new plowing practices. Here participation was seen more challenging, and frustration from farmers was described because results weren't immediately observable. Hence, participation fluctuated over the years. Positive experiences from farmers

participating helped gain new partners, as they acted as examples for other farmers (local actor #3).

The motivation to participate as a volunteer is unclear. Suggestions hereby point to interest and curiousness. In some cases, financial reasons can be assumed, and in others, expected personal gains by taking part. A sense of responsibility was reported, especially concerning the composting project, where enthusiastic children encouraged parents to participate and help them segregate waste (local actor #3).

Who participated in the projects depended on the specific cause. The forest project attracted diverse volunteers from different educational backgrounds and ages, as interviews highlight (researchers #1 & #3; local actors #2 & 3). One researcher points to an observed possibility that opposing people (especially farmers) were never reached or engaged with: *"But I think I'm a victim to a bit of a bias here because it is also those farmers [participating] that you can easily approach."* (Interview researcher #2).

Membership in the SUSA took place on different levels. Interviews outline a high sense of ownership of a few members, while many were only "members on paper" (Interview researcher #1, local actor #5). Even though the SUSA had 60 members at some point, a minority was involved in the association's everyday activities (Interview researcher #1). Here the statute of the association indicates that mainly the board of directors, consisting of 5 members, was holding those responsibilities. This board had high responsibilities and was perceived to encounter challenges in the assumed workload in managing the association after several years (researcher #1, local actor #2, #5).

The motivation to participate in the research process through the SUSA was explained as having an interest in research activities and learning about sustainability. Mostly, however, it was connected to transferring transformative knowledge to the community (local actors #3, #4, #5). However, it is essential to note that membership in SUSA was not synonymous with participation in the research process. Within SUSA, the 29 founding members 20 were male. The board of directors were represented by three male and two female members. The president of the association was a woman. No precise statements about all members' socioeconomic backgrounds and education can be made. Highly committed members, however, appeared to have a higher level of education.

This engagement structure was ultimately described as exposed to 'conflicts of understanding and process ownership and local hostilities and power balances' (Petridis, 2017). To engage with this in more depth, *figure (6)* elaborates on identities unfolding on the island. Identity in this master's thesis is understood as different relationships to the island. Identities are described as divided into simplified categories such as "locals," "foreigners," and "outsiders." These distinctions had been utilized in the previous research project on the island and were elaborated in this thesis in section 2.1.4 of *previous research on Samothraki*.

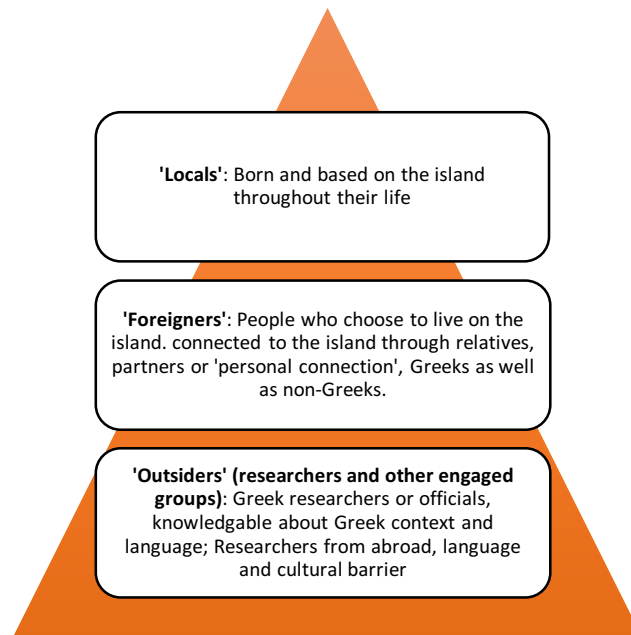


Figure 6: Categorization of island identities (Source: the author).

For this research, another category was established in addition to the existing ones. Researchers were found in the 'outsiders' category only. While some researchers are of Greek origin, most hold nationalities outside Greece. Many of the members of SUSA were associated with the foreigner group (even if they are of Greek origin). This caused tensions within the community, as expressed by a local actor: *"Most of the active people in the association were what they call on the island foreigners, so (laughs) not local, we weren't born there, [...] so people always (thinks for a bit) in most cases we were [...] the locals were a bit skeptical about us"* (local actor #3). As the CS project unfolded, research activities were thus seen as being negotiated between the two groups, 'outsiders' and 'foreigners.'

A largely male representation is evident in SUSA but under female leadership. One male interviewee in this context commented that his gender helped to communicate with and be accepted by the local community. At the same time, he was concerned that female leadership may not have been as well received (local actor⁸). As another interviewee further elaborated, a project participant who later withdrew initially expressed concerns about having an association composed mainly of women, while remarks were made that [...] "in Greece it's impossible, you can't..." [...] (Researcher #3). Applying a feminist lens, further information was obtained through the application document for the MAB⁹. Here, some interviews point to the common practice of gendered inheritance tendencies of farms, with succession of male family members, which points to the disadvantage of women in agriculture.

These conflicts and frustrations contributed, among other things, to the president's resignation from her position in 2019, followed by the resignation of the vice president at a

⁸ For the sake of anonymity, the specific local actors will not be mentioned here

⁹ (Samoethraki Biosphere Reserve Nomination Form, 2013)

later point (local actor #2). Interviewees spoke of a time when interest in engaging in the SUSA declined, mentioning words such as burnout and being fed up (local actor #2, local actor #4, local actor #5). This is a perception ultimately shared by researchers who perceived key individuals in this association with much engagement during their work, which, after they left, generally decreased (Researcher #1). Researchers partly explained the general success of the SUSA as a result of the strong individual commitment of a few. After a local person took over the presidency, further conflict and a general disappointment in how things were being handled internally were described. This was a period characterized by many as becoming increasingly difficult in regard to communication between SUSA and researchers (local actor #2, #4, researcher #1, #2, #3).

As a result, participation from diverse backgrounds was somehow identified by local actors and researchers as a challenge (local actor #2, researcher #1, #2 #3). Perceived barriers and possible explanations are summarized in table (3). One barrier was seen in communication. On the one hand, there was a language barrier between many researchers and the local community. On the other hand, the scientific language was highlighted by one local actor and two researchers as a possible barrier (Researcher #1, local actor #2).

Perceived barriers for participation	
.	Communication (German, English, and Greek; scientific language)
.	Missing link between actors with different backgrounds and opinions
.	Resentment towards the SUSA
.	Time
.	Lack of self-efficacy and bad experiences with collaborative efforts

Table 3: Identified barriers for participation (Source: the author).

Another barrier, coming back to the aforementioned, was seen as simple accessibility of people with diverse backgrounds for the researchers (researcher #2). One researcher mentioned misunderstandings about payments as a reason for some 'locals' to be skeptical of the collaboration between SUSA and researchers (researcher #1), adding to the resentment towards the SUSA from parts of the local community.

Time, on the other hand, was mentioned by local actors as a restraining factor. Most research activities were planned in the summer months. The local community, however, generates most of the islands' income within those months, giving the impression that, for some, participating was not an option. One local actor, however, also questions if this was only due to a lack of time or an actual wish to participate (local actor #2).

Another reason for a barrier to participation was a perceived lack of self-efficacy from parts of the local community toward pro-environmental outcomes. Self-efficacy is the belief that one's behavior can lead to a certain intended result, referred to as outcome expectation in the literature (Tagkaloglou et al., 2018). Local actors generally refer here to a perceived

negative experiences from the local community with collective action. Due to this they summarize a perception of the local community not to participate in collective action, as is illustrated by the following statement: *"There is a disappointment so deep, [...] and this is accumulative because already (short break) most of the people had more disappointments from collective participation before (local actor #2)"*. Similarly, one researcher shared experiences of working with local fishers. They were willing to participate in research activities such as discussions and focus interviews and contribute ideas to solve problems in the fisheries sector. However, the researcher then perceived the frustration among the fishers about slow progress. Since their participation had no visible impact, more intensive participation did not prove to be an effective strategy for the fishermen (researcher #3).

4.4 Outcomes regarding learning, gained awareness, lessons learned, and disappointments

Insights into the project's outcomes were obtained exclusively from the semi-structured interviews with local actors and the researchers from the CS project. While evaluation of such outcomes was neither sought nor deemed possible due to the scope of this research, the actors' perceptions serve as the basis for this analysis. A comprehensive report on outcomes for the CS project is unavailable from the research project side. In the interviews, questions were asked about both general and personal outcomes. However, outcomes are also related to perceptions and expectations about the project and are, therefore, different for the two stakeholder groups of local actors and researchers.

The outcomes perceived and reported by both stakeholder groups were primarily related to learning and awareness raising. Learning was related to SUSA members, while awareness raising was applied to participating citizens. Overarching, as learning encompasses various aspects, local actors perceived gaining content knowledge about sustainability (local actors #2, #3, #4). Specifically, the socioecological approach was highlighted by two actors in this context, emphasizing that it helped them understand environmental issues more dynamically and as linked to social problems (local actors #2, #3). While *"learning how to use certain research methods"* was stated as a goal of the CS project (Petridis et al., 2017, p. 123), few local actors mentioned gaining this during the process, except for those who expressed greater interest in the research process (local actor #2, #3).

Gaining scientific skills, however, did unfold on another level. A researcher explained, *"Yea, both in primary research, taking action looks like... a bit different. But in primary research and get them [the SUSA] interested in the process and make them understand how you proof something or how you find out about something, then we were successful, I think."* (Researcher #3). This was most evident through the elaboration of local actors about initiatives, exemplified by the collective resistance organized by SUSA against the Greek government-backed plan of an international industrial conglomerate to build wind turbines on the summit of Mount Soas (Fischer-Kowalski et al., 2020). This activity was widely mentioned in interviews and perceived as a success. Here, the learning effect is illustrated by SUSA's approach. SUSA

recognized the need for scientifically sound information on the potential impact of such a project on the island to be made available to the local community. This was done with the help of the International Scientific Advisory Board (ISAB), which provided studies on the subject. SUSA obtained an overview of the issue through scientific research and provided objective information to the local community and council. Weighing the pros and cons, it eventually helped the local council decide against the project (local actors #1, #2, #3, #4).

Awareness raising was especially evident in the forest project. Local actors highlighted the value of the hands-on experience by collecting data on the forest (local actors #2, #3). Similar experiences were made by local actors involved in the composting initiative at the schools. Gaining intergenerational awareness was suggested by an involved local actor (local actor #3). While this was also seen in the biodiverse pasture initiative, it was reported as a longer process. While some farmers adopted suggestions from the beginning, some needed more convincing evidence from other farmers to participate (researcher #1, local actor #3).

Researchers' overall elaboration on possible gained learning objectives highlights that the focus on some individual local actors might have been too narrow (researcher #1). Adding to this, the need was identified to take more general structures, such as Greek politics, outside the island, into account (researcher #3). Furthermore, the need to plan 'exiting strategies' more carefully. So to say, ensuring how such projects could continue on a local level without their interference (researcher #1). They then concluded that the overall collaboration with local actors was enriching. And although disappointments are expressed from their side, they see the research efforts as a reasonable basis for further actions and as rich in experience. For them, social change is finally expressed through the need for long-time engagement (researchers #1, #2, #3).

In contrast, the local actors initially perceived a general enthusiasm among islanders about the SUSA initiative. Both groups used words like "hope" for sustainability efforts on the island (local actors #1, #2, #3, #4, researchers #1, #3). As the process progressed, this diminished, while at the time of the interviews, everyone appeared tired and "burned out." This goes so far that the lesson learned is to stop participating in an association, as described by two actors (local actors #4, #5).

5. Discussion

This section presents a discussion of the main findings in relation to the relevant literature. In addition, the methods and theoretical framework are briefly reflected upon, and the limitations of this study are outlined. The process will be discussed through the co-created project design and participation with related challenges. This is followed by increased attention to power relations and identities on the island. Finally, process reflections as a tool will be discussed at last.

5.1 Co-created project design

The process of the CS project, as stated in the theoretical framework 2.2, was first of all understood as the way the project was planned and the actual implementation. To relate the planned project with the actual implementation, the definition of co-created projects states that at least some citizens are invited to participate in all or some phases of the research (Bonney et al., 2009; Gunnell et al., 2021). As stated in section 4.1, the citizens were to be represented by the SUSA, whose members were invited to participate in the research. The stages in which they were to be involved were then defined by more specific objectives mentioned in the above section.

Insights were gained that individuals were involved in the *problem definition* exemplified in the early initiation phase through "explorative and visioning focus group", and through the collaboration with different actors on and outside the island (chapter 4.1). *Co-defining the research questions* is not easily identified. Still, statements from local actors point out that some of them had the chance to take part in the decision-making to some extent and that their opinion was valued in some parts of the process (chapter 4.1). *Involvement in data generation* is evident through the implemented CS activities in chapter 4.2. *Learn how to apply specific methods* applies to some SUSA members, as presented in 4.4.

Finding a shared vision, however, was identified as already pre-defined by the researchers through the BR concept (chapter 4.1). The picture painted by the feasibility studies of the 2007-2016 research phase shows a remarkably positive response to the research project from diverse local actors (Sigh, 2010; Simron J. Singh et al., 2011; Simron Jit Singh et al., 2012, 2013). However, farmers' reservations about such a vision are not addressed in detail. A factor that can be considered critical, as overgrazing is highlighted as one of the most pressing problems in the 'Sustainable Samothraki' research. Therefore, as argued within the CS literature and considering a participatory approach, farmers should be considered as important actors in decision making for solutions and measures (Chambers, 1994; Irwin, 1995; Sauermann et al., 2020). Concerns from farmers to lose land appears to be justified by the prevailing trend of smallholder farmers disappearing since the 1970s on the island as highlighted by the socioecological research (Noll et al., 2020). The literature on food sovereignty as a bottom-up tradition contains valuable insights on land rights and the aspects that should be attended to (Pimbert, 2006). Moreover, gender sensitive research in this regard seems essential to further examine the unequal rights of women and men on the island in realizing their land rights, which has been highlighted in 4.3. (p 43).

Regarding the interpretation of the results, one interviewee indicated being involved in conducting an analysis for the composting initiative. However, this was the only existing reference to such a step. In addition, this activity is not specifically mentioned in the previous project's papers and reports examined. It is assumed that this step may have occurred throughout the process without indicating any specific contributors, making it impossible to understand this step. The literature on this topic points to the lack of clear guidelines on ways

for including and recognizing citizens' contributions. Suggestions are to grant them co-authorship or co-investigator status (Froeling et al., 2021). It is assumed that the role of the concerned actors here in interpreting data was only minor since mentions of contributions are made through acknowledgments only.

The definition of co-created projects vaguely refers to some parts of the public and allows considerable freedom to decide which parts of the research they should be involved in. In the case of the CS project on Samothraki, primarily individuals from SUSA participated in and contributed to several phases of the research. Yet, still aligning with the definition of such projects. They then adopted, comparable to other CSOs, a technical, governance, and advocacy role (Göbel et al., 2021). This was evident in all activities. In summary, then, SUSA has been instrumental in the implementation of research at the local level. In contrast, citizens representing the general public were only invited to participate in the research process through data collection. This is more in line with the characteristics of a contributory CS project, where participants cannot actively decide which direction the research should proceed. Considering the above, the CS project on Samothrace between 2016 and 2018 can be viewed as a co-designed project type. The literature describes co-created projects as especially accurate when striving for democratization of the research process and for the empowerment of local actors (Eitzel et al., 2017; Gunnell et al., 2021). Critical reflection by some authors of the CS promises encouraged considerations of patterns of participation and assigned roles within the project outlined in the next section (Kimura et al., 2016; Strasser et al., 2018).

5.2 Participation patterns and related challenges

While the overarching vision of the entire 11 years of research was identified as the establishment of a UNESCO-MAB reserve, the rationale for using a CS approach is seen in conducting people-centered research. This was highlighted by aiming to empower islanders to strive for "real, sustainable development," ensuring continuous efforts in the future by the local community (Petridis et al., 2017, p. 123). This is an assumed positioning towards democratization of the research process, which makes the discussion about participation significant.

As highlighted in the literature, a co-created CS process assumes a high degree of alignment of the research agenda with community priorities, to begin with (Vadjunec et al., 2022). Researchers described a group of young women pursuing environmental education goals as a starting point. From issues with waste management, overall, a more holistic research project unfolded from this point. The BR concept, framed as a way to design and implement sustainability, was perceived as attractive to many stakeholders on the island. However, other groups, such as livestock farmers, were skeptical. Moreover, the multi-faceted content of this concept of sustainability was experienced as complex at times. A certain amount of contextual knowledge and related education was required to share and understand this vision. This appeared to attract people with specific educational backgrounds. This is consistent with the

general tendency of CS to attract citizens with higher education and pre-existing interest in research endeavors (Mueller et al., 2011; Sauermann et al., 2020).

One approach to incorporate and translate this concept to the local community was to be realized by establishing the SUSA. In conjunction with the literature on the role of civil society organizations (CSOs) in CS projects, this is seen as a way to include voices typically overlooked in research processes, thus offering them a platform to have their causes heard (Göbel et al., 2021). Some scholars argue that studies can be considered valid without being representative of the broader population. It is seen as dependent if the results are applicable to the community in question (Froeling et al., 2021). Other scholars discuss the necessity of representativeness because this group can actively influence research toward perceived problems and subsequent solutions (Sauermann et al., 2020). However, a prerequisite for exerting influence is the need to be seen as an equal partner in shaping the research, as suggested for co-created projects (Bonney et al., 2009; Shirk et al., 2012).

Before scrutinizing the structure of the SUSA more carefully, one clarification is necessary. While the association was defined and understood as an organization bridging research and the local community, few members appeared to be actively involved in those tasks. The results about the structure then show that SUSA's founding members are predominantly male, while the board appears balanced with three male and two female members. The president of the association is female. Furthermore, findings indicate that highly engaged members are often female. As feminist literature points out, social differences such as gender shape how one interacts with their environment and what responses one can develop (Elmhirst, 2015). The assumption here prevails that gender plays a crucial role in the agency. Interviews point to a possible rejection on a community level towards the SUSA through female leadership. Legitimacy, thus, had to be contested more than if there had been male leadership. This might be seen as additional workload for female members, ultimately leading to a perceived overwhelming workload and frustration of not being accepted. Gender as a social construct is especially significant in rural societies, where patriarchal relations are particularly pronounced. Women tend to be marginalized in farming through their lack of rights to land ownership and lack of decision-making power (Pimbert, 2006). Aspects considered relevant in a research process concerned with equal participation and empowerment. So far, however, not addressed in previous research on the island.

The literature on collaborative projects emphasizes the need to foster partnerships between researchers and contributors from civil society to mitigate challenges in the process. This is due to the inherent power imbalances such projects hold, whereas researchers remain in a senior position (Gunnell et al., 2021). The mentioned explorative approaches are seen to hold value as they give priority to local knowledge, thus acknowledging other ways of knowing besides scientific knowledge. Local leaders and networks were invited to collaborate as alliances were built, legitimizing the project and thus creating high value and niche partnerships (Vadjunec et al., 2022). As for the relationship between SUSA and researchers, a long preparatory phase seemed to encourage and build mutual trust. Moreover, deeper

personal relationships established good communication between the two partners. As the project progressed and SUSANA established its own goals as an association, the initial objectives of the collaboration were hard to maintain. This can somehow be interpreted as a conflict of interest between social change objectives by SUSANA and scientific deliverables for researchers. This, in the literature, is described as a common obstacle in co-created projects (Froeling et al., 2021; Gunnell et al., 2021).

Highlighted in section 4.3, the co-created project was negotiated primarily between SUSANA and researchers, thus mostly between *foreigners* and *outsiders*. Analyzed case studies by Göbel et al., (2021) suggest that CSOs were only perceived as legitimate entities in pursuing social and political change through their collaboration with scientists (Göbel et al., 2021). While SUSANA gained legitimacy within the political sphere through their cooperation, the analysis points to perceived difficulties in the approval by the local community. Instead, it seems there was resentment towards SUSANA. Thus, it is necessary to explore the suggested identities and the social differences in which those identities are embedded.

5.3 Attention to identities & power

The introduced categories on identity applied by the previous research are seen as helpful in highlighting social differences on the island. Labels, however, should be used with caution. This is particularly important given the concept of *islandness*, which calls for critical reflection on how islanders are conceptualized in research (Nimführ et al., 2021). On the one hand, this applies to describing specific characteristics to groups, such as an inability to engage in meaningful collaborations. Another example comes from (Pimbert, 2006), who calls for caution in dealing with narratives that describe local misuse of resources as the cause of environmental degradation and describe resource users as uneducated and non-innovative. This creates narratives that are difficult to debunk and ultimately serve as incentives for certain policies. Furthermore, as (Baldacchino, 2008) points out, it is essential to resist reductionist descriptions that deprive groups of explaining themselves. Viewed through a feminist lens, these identities lack an important element, namely the power in which these identities (can) operate.

As (Göbel et al., 2021) eloquently highlight in their study on the role of CSOs in CS projects, social interactions between different actors have to be understood as embedded in hierarchies. This becomes specifically evident in the practice of knowledge production. Although power relations are considered relevant in the CS literature, hardly any examples are given that pay attention to them or indicate how to manage them (Burke et al., 2014; Froeling et al., 2021; Gunnell et al., 2021; Sauermann et al., 2020). Power relations in the observed project were recognized but commonly described by researchers as occurring at the local level. As Petridis and colleagues argue: “*Science controls neither money nor power; it only has some control over the consciousness of people (knowledge, beliefs), depending on communication and trustworthiness.*” (Petridis et al., 2017, p. 127). Power may be viewed as control over material resources and intellectual resources, and ideology (Cornwall, 2016). It is

thus argued that science holds power, especially because it controls knowledge and beliefs (Burke et al., 2014; Pimbert, 2006). Translated to the identities of Samothraki, researchers have power on many axes that should be accounted for in the research process.

To add another layer of power relations, a suggestion by Baldacchino (2008) seems useful to derive meaning from the relationship between islanders and outsiders. He assumes a multiplicity of identities that unfold on islands. However, he notes that developmental processes that emerge on islands are usually externally driven. He then describes the outsider position of these actors as free to address problems and strive for specific solutions. Islanders, on the other hand, are constrained by social realities on the island that limit social confrontation of sensitive issues. In the case of Samothraki, the problem of overgrazing can be considered as such. Expressing concerns about it could be perceived as unacceptable, as agrarian societies are characterized by family networks. This has been referred to as nepotism in the socioecological research (Fischer-Kowalski et al., 2020). One interviewee pointed out that critical opinions would subsequently mean confrontation with one's own family (local actor #2). In the context of this theory, outsiders then automatically hold more power, while islanders respond to this restricted power with "agency in context" (Baldacchino, 2008, p. 41). Agency in context here describes a generally positive or neutral reaction to novel agendas, however, without any further commitment, ultimately knowing that one is on the receiving end and does not have enough power to be equally heard in decision making (Baldacchino, 2008).

SUSA was then supposed to mediate between these two groups. However, as mentioned above, they were not considered "real islanders," and a conflict arose at the local level. Local power dynamics thus overshadowed the project. This was one of the reason why the SUSA was not further continued. Highlighted by feminist theory, the process of empowerment involves changing the way people perceive the world around them, creating the possibility for them to detect inequalities and choose to alter social constructs (Cornwall, 2016). Challenges faced in the case of Samothraki seem to unfold through possible barriers to getting involved in the research process. Examples would be the level of education that was required to become involved, but also the language barrier.

Given CS's lack of guidelines and examples for dealing with power, PAR appears to be an attractive practice to draw attention to, as suggested by some scholars (Froeling et al., 2021; Vadjunec et al., 2022). The central tenets of this practice revolve around social change and local empowerment (Eitzel et al., 2017; Froeling et al., 2021). Power relations are contested by dimensions such as action and knowledge. If the way knowledge is produced is not questioned, e.g., by researchers as experts and citizens 'being studied', rather than being actively involved in research, the status quo might only be reinforced (Cornwall et al., 2017).

This seems relevant to the context of Samothraki, as the issue of overgrazing is frequently raised and thus has implications for pastoralists. The researchers engaged with farmers on multiple levels, through interviews, focus groups, the Happy Goats app, and the sown pasture project. Thus, the socioecological researchers approached the topic not only from a natural

science perspective, but also highlighted economic and social aspects such as economic constraints and dependence on EU subsidies (Sauermann et al., 2020). However, knowledge production still seemed to follow the premise that scientists are experts and farmers lack experience and knowledge. Possibly, this reinforced power relations and caused some farmers to be resentful of the research project. Another relevant finding of the socioecological researchers in this regard is the negative experiences of farmers with those in power through the history of agricultural cooperatives, as mentioned in Section 4.1 (p. 33). Thus, a possible negative feeling in working with researchers was present from the beginning. Thinking about such power imbalances and reflecting on power hierarchies associated with the role of a scientist seems necessary (Cornwall et al., 2017)

5.4 Reflections as a tool for improved outcomes

As indicated by the CS literature, there is a tendency to recruit individuals with higher socioeconomic means, higher educational backgrounds, and pre-existing interest in science (Argyri et al., 2021). On the other hand, historically underrepresented groups are reported to experience constraints to participate due to limited resources available, such as time. This suggests that researchers need to allocate more resources to convince specific groups to participate. In addition, involvement could then be associated with lower engagement due to a lack of interest in the research process (Sauermann et al., 2020). Furthermore, it has been suggested that specific groups simply might not be interested in participating or do not feel empowered enough to take part in the research (Gunnell et al., 2021). Time constraints, lack of interest or self-efficacy seem to be all possibilities in the case of Samothraki for more diverse participation.

In contrast, the CS activities that have been implemented provided positive examples of diverse participation. Volunteers participating were reported to be farmers, children and their parents, students and tourists ranging from people of different ages and educational backgrounds. In depth evaluation about demographics and experiences of those volunteers and what motivated them to participate in the specific activities, are however absent. While reflections were reported within the transdisciplinary research team, discussions were not extended to the contributing individuals from SUSA or volunteers. Mapping volunteers' expectations and motivations to participate have been highlighted in the literature as relevant to ensure mutual benefits and to draw lessons learned for the involved parties (Gunnell et al., 2021; Vadjunec et al., 2022).

Colston and Colleges (2015) further suggest that, in addition to process reflection, citizens should be involved in decision making about the products of CS projects. Products are understood here as the place-based data made available. The argument is that the data generated through the process can be useful to both the community involved and the researchers, but that they are also "instruments of social, cultural, and political power" (Colston et al., 2015, p. 67). Which relates again to the suggestion that knowledge production is embedded in power relations. Thus, carefully considering who these products are shared

with and in what way. So to say reflecting with collaborators not only throughout the process of where research should go but also discussing what happens with insights gained (Colston et al., 2015). This can be extended to diversity of participation by asking who should or must contribute to the research process in the CS project to achieve specific goals. Thinking about who is then actually involved in the project provides an option for alignment and an opportunity to think about how to further implement incentives to encourage citizen participation. The question of who will decide which citizens are to participate also provides an opportunity to think critically about power relations and to question the role of researchers in this process (Agnello et al., 2021; Eitzel et al., 2017).

Consideration of reflections as a tool has been, however, mainly highlighted in the literature in the context of achieving learning outcomes (Bonney et al., 2016; Burke et al., 2014; Kimura et al., 2016). Knowledge, in popular education, is described as evolving through critically examining what is already known, seeking other perspectives for analysis through which refined knowledge evolves, which should then be implemented as action (Burke et al., 2014). As a result of self-reflection, social learning can occur and is ultimately reported to increase self-efficacy. Conservation efforts can be improved by identifying tangible actions for doing something good for the environment (Kimura et al., 2016). Based on the findings from this thesis, local actors and researchers themselves have identified such reflections as absent. This master thesis, however, was able to identify potential outcomes regarding awareness raising and learnings. However, more far-reaching insights could have been generated with the knowledge of participating scientists and reflections from their side. In order to strive for democratic science, reflexivity and critical reflection on the power they hold is called upon (Burke et al., 2014). Therefore, a missed opportunity to learn from experience and to develop possible exit strategies to continue the project on a local level is seen here. Important insights were gained through reflection in a dissertation, which were used to guide this analysis and ultimately proved helpful (Petridis, 2017). This highlights that with commitment to reflections important experiences can be shared, creating a learning process. Sharing insights, furthermore, is highlighted by the literature as needed to further progress CS and especially co-created projects (Froeling et al., 2021).

5.5 Final reflections on this master's thesis

The qualitative methods used in this research proved valuable in gaining insights into perceptions from researchers and local actors about the CS process. Observations were useful in extending the interviews' expressions and forming one's own impression. Interviews with other local actors, volunteers from the CS activities, and farmers, however, would have enriched this research. Since a large amount of data is available due to the long-term research on the island, it may be the case that key points were overlooked. In retrospect, follow-up interviews would have allowed for a deeper understanding and member checking of the assumptions made in this research. This thesis, however, underlies limitations. First, for obvious reasons of time constraints under which a master thesis must be completed. Time would have been a precious resource on the island to develop further insights into island life.

Other limitations include being an outsider myself, facing a language barrier, writing about outsiders, which should ultimately be remedied by considering the concept of *islandness*.

6. Conclusion

This research aimed to explore a citizen science process and its implications. The process was scrutinized through a theoretical framework based on CS principles. The concept of *islandness* and elements such as power and agency from feminist theory complemented the approach. To summarize, the examined CiSciSusaki project unfolded in two different streams. On the one hand, individuals from the SUSA were identified as close collaborators in some research parts, such as problem definition and data collection, achieving some learning objectives such as how to apply scientific methods. Through the analysis, different roles were identified in jointly implemented CS activities. The SUSA adopted a technical, governance, and advocacy role, bridging the socioecological research with the local community. Thus, by definition, a co-created project between scientists and the SUSA unfolded. On the other hand, citizens were only involved as volunteers in specific activities through data collection.

Given the identified lack in the literature of practical experience with co-created projects, this research contributes to a deeper understanding of the challenges of such projects and the potential outcomes that can be achieved. This research has identified a diverse participation in the CiSciSusaki project process as a challenge. It is necessary to carefully plan who the research should involve in accordance with the research objectives. Although not every project will necessarily involve the public in a representative manner, the CiSciSusaki project, with its vision of sustainable development and its goals, such as the empowerment of the local community, was measured by this standard. By traditional academic logic, this task may appear unrealistic, as projects are typically limited to three-year periods, and diverse participation is related to an extended need for resources. The definition of co-created CS projects proved flexible, and the lack of experience makes it difficult to navigate in questions such as participation. The inability to judge what a successful project might look like, aligning with the CS literature, calls for developing clear strategies for assessing CS projects. Therefore, reflections from the beginning to the end of the project are encouraged to share positive and negative experiences to progress this research approach further. These reflections seem particularly important in assessing outcomes such as learning, raising awareness, and empowering the local community. This is also seen as essential to ensure mutual benefits for researchers and citizens involved in such projects, which must be taken seriously to fulfill widely hoped-for promises such as the democratization of research.

By integrating a feminist perspective in this thesis, attention was drawn to power and gender dynamics. Applying a gender-sensitive research lens reveals deeply-rooted patriarchal structures in society. To better understand the implications of this results, future studies could address these structures to account for historically marginalized groups. The feminist approach, furthermore, helped uncover power relations in knowledge production. Applying participatory methods ultimately makes it essential to engage in such power relations to take

advantage of CS in contributing to the democratization of research. The feminist inquiry adopted in this thesis thus helped pay attention to underlying structural dynamics that have been unattended so far.

Identities were scrutinized utilizing the concept of *islandness*. It proved helpful in critically reflecting on how islanders are framed in research and how such a perspective should be applied with caution. Through this approach, limitations developed throughout the investigation since views about islanders had to be presumed. CS can remedy such assumptions by inviting islanders to participate in research. Barriers in this context were uncovered that might prevent certain groups from participating. Furthermore, as encouraged in the literature, reflections, and assessment of the process by involved researchers could have gained more nuanced results. The 10-day summer school provided a valuable entry point into the case study by becoming acquainted with different actor groups on the island. The fieldwork then offered a deeper understanding of the Greek context and how the CiSciSusaki project and the researchers came about and developed over time. Limitations were identified through missing perspectives of local actors with possible opposing opinions. The qualitative research approach, however, helped remedy this by being open to unexpected results and changing situations. This was seen as a prerequisite for ethical research and being open to different identities and perceptions while being aware of one own biases.

Aligning with other scholars, this research identified principles used in PAR as accurate to address power relations, so far relatively unattended in the CS literature. This is especially evident with co-created projects since PAR has a long-time history of engaging and working with communities with participatory methods. To navigate through science-community collaborations, this practice seems to hold valuable insights. Moreover, with its attention to social and environmental justice, the democratizing virtue can be enriched through those experiences. Applying a feminist approach to the case of Samothraki itself could lead to new findings and is seen as helpful in drawing attention to so far unrealized perspectives. Furthermore, in-depth research about power relations between science and the public through the lens of feminist theory could, in the future, deliver a more precise and in-depth analysis. The use of food sovereignty literature could also provide fresh perspectives for rural livelihoods on the island to develop strategies to support struggles for equal land rights. In alignment with a comment from a researcher from the CiSciSusaki project the need is seen in addressing broader structural barriers for sustainable development. Especially feminist theory and food sovereignty literature seems useful in this regard in critically reflecting on capitalism, the patriarchy and neoliberalism preventing broader change from taking place on a local level. In sum, this research encourages ongoing commitment of participatory research for sustainability on the island, with special attention to often overlooked elements. The proposed concepts can help to advance the democratization of research.

7. References

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8. Annex

Annex 1: Interview guide (for local actors)

Research question	Interview question
<p><u>The initiation phase:</u></p> <p>How did the collaboration come about, were there any agreements, and what were its aims, what roles did the different actors or actor groups play?</p>	<p>Could you start telling me about the collaboration between ?</p> <ul style="list-style-type: none"> • How and when was the idea of this collaboration born? • When did it officially start? • When did you get involved in this collaboration? How did you learn about it? What was your motivation to get involved? <p>Could you tell me a bit more about how you understood the citizen's science approach and the overall aims of the collaboration?</p> <ul style="list-style-type: none"> • What was your understanding of the citizens science approach? • Was there a clear understanding and mutual agreement what this approach should look like? • Were there clear roles assigned to different actors in the collaboration? If yes, what was your role in the collaboration? • What were the main aims of this collaboration? Were you involved in deciding about these aims? • Were there any specific formal agreements in place? Were these conveyed in writing or orally?
<p><u>The process:</u></p> <p>How did the process of collaboration evolve over time? Did any conflicts evolve over time? Was there a perceived "shift in responsibility"? Were there any power relations in play?</p>	<p>Can you elaborate a bit more about the process?</p> <ul style="list-style-type: none"> • what were the first activities; how did they continue? • Was there any guideline/plan in place to ensure the prior agreed terms were followed? • Were there any plans for a "shift in responsibilities"? • Was there any guideline/plan in place to ensure the prior agreed terms were followed? • How do you feel about the overall dynamics among everyone involved in the collaboration/ in the process? • Do you feel that your specific position, for example your age, gender, personal background, prior knowledge etc. influenced your role and what you were able to contribute to this collaboration?

	<ul style="list-style-type: none"> • Do you feel everyone was sufficiently included and had a say in decisions taken? If not, why not? <p>Could you re-cap on the approach of citizen's science?</p> <ul style="list-style-type: none"> • '(How) do you think the citizen science approach has influenced the collaboration and the process? • 'Do you think the ideas of the citizen science should be / are important in the further collaboration – why?
<p><u>Challenges:</u></p> <p>What challenges were met by the collaboration and by different stakeholders in this process?</p>	<p>From your perspective what were challenges throughout the process?</p> <ul style="list-style-type: none"> • In your view, what were some of the challenges experienced throughout the process? How were these challenges addressed? • How did Corona impact on the collaboration, and on the project aims and planning in general?
<p><u>Outcomes and learnings:</u></p> <p>What learnings did this collaboration achieve and what other outcomes did it have? What lessons were learned throughout this process and what are future perspectives?</p>	<p>What do you think were leanings/lessons learned from this collaboration?</p> <ul style="list-style-type: none"> • What did you personally learn from this collaboration? • What do you think members of the collaboration together learned as a collective? • Were there any learnings for outsiders of the collaboration? • Do you feel the collaboration had any impact? How would you describe this impact? • Which activities or visions are still in place from your past work you think? • How could you imagine the collaboration going forward?

Appendix 2: Information sheet for interviewees



A citizen science approach to local collaboration for sustainability on the island of Samothraki

Exploring the collaboration between the Sustainable Samothraki Association, social-ecological researchers and the local administration from 2014 to present



Information Sheet

You are being invited to take part in research on a citizen's science approach to local collaboration for sustainability. Flora Rainalter is a master's student at the University of Natural Resources and Life Sciences, Vienna & University of Copenhagen and is leading this research. Before you decide to take part, it is important you understand why the research is being conducted and what it will involve. Please take time to read the following information.

What is the study about?

The purpose of the study is to explore the collaboration between local activists, the administration and researchers under the umbrella of a citizen's science agenda between 2014 and present. The focus is on the process, challenges experienced, achievements and potential future perspectives.

Why have I been chosen to take part?

You are invited to participate in this study because you have been identified as being part of one or more stakeholders of interest in this study.

What are the benefits of taking part?

There may be no immediate benefits to participating in this study. However, it may help to learn something from the experiences of the past and to deepen the knowledge and understanding of these processes. By sharing your experiences with us, you will be helping Flora Rainalter and the University of Natural Resources and Life Sciences, Vienna and the University of Copenhagen to better understand the collaboration between different actors striving for sustainable change. The example of Samothraki may further help other initiatives to better understand the processes involved.

Are there any risks associated with taking part?

No.

Do I have to take part?

No – it is entirely up to you. If you do decide to take part, please keep this Information Sheet and complete the Informed Consent Form to show that you understand your rights in relation to the

research, and that you are happy to participate. You are free to withdraw your information from the project data set at any time and without reasons if you want. You should note that your data is going to be used in the production of a thesis and maybe at a later stage for a journal article. If you would like to withdraw you are asked to contact the lead researcher at the earliest opportunity. You do not need to give a reason. A decision to withdraw, or not to take part, will not affect you in any way.

What will happen if I decide to take part?

You will be asked a number of questions regarding this collaboration, your experiences and how you perceive the collaboration. I would like to audio record your responses (and will require your consent for this). The interview should take around 1 hour to complete.

Data Protection and Confidentiality

All information collected about you will be kept strictly confidential. Unless they are fully anonymised in our records, your data will be referred to by a unique participant number rather than by name. If you consent to being audio recorded, all recordings will be destroyed once they have been transcribed. Your data will only be viewed by the researcher/research team. All electronic data will be stored on a password-protected computer file. Your consent information will be kept separately from your responses in order to minimise risk in the event of a data breach.

What will happen with the results of this study?

The results of this study may be summarised in published articles, reports and presentations. Quotes or key findings will always be made anonymous in any formal outputs unless we have your prior and explicit written permission to attribute them to you by name.

Making a Complaint

If you are unhappy with any aspect of this research, please first contact the lead researcher, Flora Rainalter.



Flora Rainalter

Environmental Science in Europe (EnvEuro)
Master Student



University of Natural Resources and Life Sciences,
Vienna & University of Copenhagen



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If you still have concerns and wish to make a formal complaint, please write to:

Stefanie Lemke
Professor and Head of Institute for Development Research
University of Natural Resources and Life Sciences, Vienna
Email: Stefanie.lemke@boku.ac.at

In your letter please provide information about the research project, specify the name of the researcher and detail the nature of your complaint.

Thank you for your cooperation!

Appendix 3: Informed consent form for interviewees

Participant No.

INFORMED CONSENT FORM: Exploring a citizen science approach to local collaboration for sustainability

You are invited to take part in this study for the purpose of collecting data on the collaboration under the umbrella of citizen science between social-ecological researchers, the Sustainable Samothraki Association, and the local administration, underlying processes, arising difficulties, and achievements since 2014.

Before you decide to take part, please **read the accompanying Participant Information Sheet.**

Please do not hesitate to ask questions if anything is unclear or if you would like more information about any aspect of this research. It is important that you feel able to take the necessary time to decide whether or not you wish to take part.

If you are happy to participate, please confirm your consent by circling YES against each of the below statements and then signing and dating the form as participant.

1	I confirm that I have read and understood the <u>Participant Information Sheet</u> for the above study and have had the opportunity to ask questions	YES	NO
2	I understand my participation is voluntary and that I am free to withdraw my data, without giving a reason, by contacting the lead researcher and the supervisor <u>at any time</u> until the date specified in the Participant Information Sheet	YES	NO
3	I have noted down my participant number (top left of this Consent Form) which may be required by the lead researcher if I wish to withdraw from the study	YES	NO
4	I understand that all the information I provide will be held securely and treated confidentially	YES	NO
5	I am happy for the information I provide to be used (anonymously) in academic papers and other formal research outputs	YES	NO
6	I am happy for the interview to be <u>audio recorded</u>	YES	NO
7	I agree to take part in the above study	YES	NO

Thank you for your participation in this study. Your help is very much appreciated.

Participant's Name	Date	Signature
Researcher	Date	Signature

Appendix 4: Semi-structured interview details:

Type	Length	Gender	
Local actor #1	< 1 hour	M	18.08.2022
Local actor #2	> 1.5 hours	F	19.08.2022
Local actor #3	1 hour	M	21.08.2022
Local actor #4	< 1 hour	F	25.08.2022
Local actor #5	1 hour	F	20.07.2022
Researcher #1	< 1 hour	M	17.07.2022
Researcher #1	> 1 hour	M	06.09.2022
Researcher #2	> 1 hour	M	17.07.2022
Researcher #3	> 1.5 hours	F	23.09.2022