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An Experimental Portuguese Social-Enterprise Project in Urban Agriculture: A Case Study on the Influence of the Interaction of Stakeholder Roles on Sustainable Governance

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Abstract: An experimental urban-agriculture (UA) project was started in 2018 with multiple stakeholders in Lisbon, Portugal. The project involved setting up an indoor vertical farm in a university building. Early on, there were promising outcomes across the environmental, social and economic pillars of sustainability. However, the project was closed in 2022. Here, we carried out an analysis of the sustainability-governance pillar that aimed to provide some understanding of why the project did not proceed. We used role-constellation mapping of the 27 stakeholder groups engaged. We also carried out force-field analysis of the stakeholders and their desirable or problematic interactions across seven factors of governance. Results showed that although the parties engaged represented various project aims and dimensions, there was a failure to establish a network of stakeholders consistently engaged in governance practices at the outset and in an ongoing way. Inadequate project culture and a lack of critical governance factors led to a failure in conveying a strong sense of ownership of the project to the stakeholders. This case study raises the need for future UA projects to invest in good governance structures, the promotion of dialogue between the parties, and a shared culture, in order to become sustainable.

Keywords: indoor vertical farming; sustainability pillars; governance factors; role-constellation mapping; force-field analysis

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1. Introduction

The United Nations (UN) forecasts that up to 70% of the world population will live in cities by 2050 [1]. Urban areas are critical in the shift towards more sustainable approaches to food security [2]. The need to create resilient and sustainable cities is attended to through the Sustainable Development Goals (SDG) specifically number 11, 'Sustainable Cities and Communities' [3]. Urban agriculture (UA) is viewed as a very important contributor to achieving this SDG objectives and others. UA is broadly understood as producing plants or raising animals in urban environments to feed the local population [4].

Urban agriculture covers a diverse range of approaches, such as commercial farming, research and technology projects, through the recovery of unused space or buildings to create local food-production systems or community-directed gardens and/or educationally focused projects located in schools [2]. Many UA projects provide economic, social and environmental benefits with a myriad of actors, stakeholders, desires and goals of those involved intersecting during the life of projects [5]. Value attributed to the outcomes of UA projects is context specific, as it depends heavily on how the different groups and stakeholders involved conceive of and perceive different benefits based on assumptions

about UA [6]. Further, UA experiments encompass varied and coexisting innovations, governance arrangements and understandings of sustainability that all shape stakeholders' participation [7,8].

Urban agriculture and food production have been shown to create direct impact across the three pillars of sustainability through a diverse range of contributions [9]. While traditionally the concept of sustainability encompassed only environmental, economic and social pillars, it has been expanded to include a governance dimension [7,10]. This dimension broadly contains the decision-making process related to the implementation of solutions and activities at local, national and global levels [11]. Specifically, researchers have been encouraged to move beyond merely describing governance models and to analyse the impacts of governance approaches for sustainability in organisations and projects [12]. While applied-research examples are still emerging in the literature, one study proposed seven factors and their interactions that are important to the effective implementation of sustainability in organisations, public-sector organisations and civil society. The factors identified were vision and mission, policies, reporting, communication, board of directors and sustainability department [13].

These factors point to both structural and process elements for organising social and human activities in applied projects, and are important for effective and sustainable governance. They cover the participation of different groups of roles connecting and relating internally and externally as stakeholders on behalf of represented organisations. Tazunre et al. [14] outlined that UA projects generally do not do well on economic performance. This is largely due to the financial value of prime urban land that is used for industrial or commercial enterprises with higher incomes. Less tangible benefits such as social effects are harder to measure, and may also contribute to economic performance being most often cited as limitations for the sustainability of UA ventures [14].

We suggest that the analysis of sustainability-governance factors can therefore uncover additional factors and effect the explanation of why UA projects succeed and fail. Continued research and applied examples of governance in sustainability projects are important to understand the role of stakeholder interactions in order to glean interventions and approaches that can enable successful outcomes for multiple groups and organisations engaged in sustainability projects or initiatives [15].

The conceptual and applied use of roles has a long history in sociological and human-relations studies [16–18]. Across organisations and communities, sociological role meanings generally hold a shared understanding, for example politician, university, or CEO. The circumstances in which roles are taken up are always changing, both in terms of the organisations they are part of and the external, social political and economic environments they operate within [19].

Roles are also taken up by people who have their own perceptions, histories, and desires. Therefore, roles are also influenced by psychological dimensions in how they are enacted. Roles can provide a nexus between the individual and society and are also subject to multiple forces and factors that influence how they are both experienced and taken up at group and individual levels [20]. Roles offer a useful resource in determining boundaries and resource allocation [9] and they can also be the point of exploration to determine what is occurring in the dynamics of groups or the interaction of multiple groups working together and attempting to achieve various aims [21]. Those groups, their incentives and underlying goals strongly influence the culture of the project.

Organisational culture can strongly influence performance and outcomes. Here, we define the culture of the project as the set of values and norms that govern the conduct of group members. It is therefore both implicit and explicit. It is shaped over time, and can be changed if attention is paid to how it is emerging [22]. People and groups are influenced by the views, feelings, and expectations of others toward their roles. While people and groups do have authority in how they take up their roles, human interactions, changes and behaviours will always be subject to the influence of the various processes, structures and

behaviours or culture of the multiple actors involved in the task, project or societal change at hand [23].

A role-based approach also provides stakeholders with a framework that serves to 'depersonalise' or broaden the understanding that certain actors can have multiple roles, that these roles are subject to various influences and that changes in interactions between roles can be related to broader societal change and dynamics [24]. Therefore, we submit the idea that using a role-constellation method allows a collective view of the stakeholder roles involved in UA projects and an ongoing analysis of their interactions, challenges in taking up roles and their adaption to changes as the project progresses [16]. Roles can then be understood as an object of analysis to advance our understanding and implementation of UA projects, to achieve sustainable outcomes [25].

This analysis can be particularly useful for understanding the dynamics of how projects in UA are established and why and how they can fail. There have been a number of projects documented in the literature that are no longer active or closed, and, in the case of commercial installations, shut down due to 'financial issues' with minimal justification. Parkes et al. (2022) found that out of 124 UA-project installations that were used for research publications between 2015 and 2022, 37 no longer have online activity and 19 were confirmed as closed due to 'financial issues' or discontinued research projects. One particular example is the case of Agricool, where the adoption of ag-tech was high, with multiple small-scale systems combined, within a large-scale vertical farm operating to supply one major French food retailer with 100 stores. After 6 years from the initial pre-seed investment in 2015, Agricool went into receivership in 2022, after raising EUR 35 million. Another commercial UA project, FarmedHere, recovered a 90,000 sqm abandoned building in Chicago [26] with the aim of addressing challenges of access to fresh food, was founded in 2011, invested USD 23 million, and closed in 2017 due to 'high labour and energy costs' [27,28]. These examples indicate that, regardless of the model and access to investment, targeting local supply chains still leads to difficulties for UA projects.

In this study, we introduce a case-study project in Lisbon that started in 2018 and closed in 2022 with the aim of shedding new light on the reasons why UA businesses may fail. Specifically, we use the case study to illustrate the importance of governance in the sustainability of UA projects. Because market and environmental-impact research all showed favourable signs and still the project was closed, we hypothesized that inadequate governance played a critical role in the failure in creating a sustainable business. We therefore aimed to examine various criteria for good governance and assess whether they were fulfilled during the project. More specifically, we aimed to understand what influence governance factors and stakeholder interactions across them had on the culture of the project and ultimately on its closure, given that all other axes of sustainability were positive. To do so, we constructed a role-constellation map to reveal the stakeholders and roles engaged in this project and identify the governance factors that are present in each stakeholder group. Then, using force-field analysis, we reveal the problematic and desirable governance factors and their interactions, in order to determine the influences that contributed to the closure.

In Section 2 of this paper, we provide an overview of the case study and outline the effects of this experimental UA project across the environmental, social, and economic dimensions. Our research focus in this study was on the governance pillar of sustainability to determine the influences that governance factors had on the project overall. In Section 3, we outline methods used to analyse the governance pillar, which were mostly role-constellation mapping and force-field analysis. In Section 4, we provide results and their implications and in the conclusion in Section 5 we indicate the relevance of this research for planning and carrying out future projects on sustainability.

2. Case Study—UA Experimental Project in Lisbon

2.1. Goals and Description of the Implementation of the Project

The aim of the UA experiment was to showcase the capacity of a building-integrated indoor-vertical-farming (IVF) system to exploit energy normally wasted in buildings, such as excess renewable electricity and humidity, temperature, or CO_2 in air from ventilation exhausts of the building for growing food. The business-model design aimed to address the three pillars of sustainability and provide a new benchmark for using an integrated-IVF operation as a data source for local, national, and international policymaking in the future. Overall, the UA experiment aimed to increase access to clean, healthy food for the local community, reduce waste associated with food production and distribution, and improve environmental performance of the integrated system and the building through energy efficiency.

Therefore, the project aimed to generate environmental value for the building through minimizing the carbon footprint per kilogram of food grown, providing integrated data for energy reporting and optimization, reducing campus waste and increasing access to healthy foods. Sustainability of the IVF system beyond the experiments in integration needed an economically viable business model to service local food providers or food retailers. Further, the goal for social value in the community proposed the creation of social interactions and cohesion between consumers and food services, education on sustainability and provision of employment through urban-farm operations.

The project was based in Lisbon, Portugal. The project was initiated by a social enterprise (SE1) called Canguru Foods that provided the initial scope, fundraising, recruitment, technology design, implementation, and containment over the life of the project. We anonymized the names of other stakeholders to protect the private nature of the legal relationships established with the SE1, and because they were not necessary for the purpose of this study. Table 1 outlines the active stakeholders and the abbreviations used to identify them in the case study. They were categorized by organization (institution, business, funder, or community), the type of role in the UA experiment they held and the sustainability pillar they contributed to in the project.

Table 1. The active organisations/institutions involved in the project.

Stakeholder	Commenced	Role	Abbreviation	Sustainability Pillar
Social Enterprise: Canguru Foods LDA	2018	Lead organization and project initiator	SE1	Environmental, Economic and Social
Business	2020	Supplier—technology; indoor vertical farm	BSG1	Environmental
Business	2020	Supplier—technology; IoT solution	BSG2	Environmental
Business	2018	Supplier—accountant	BSG3	Economic
Business	2018	Supplier—lawyer	BSG4	Environmental, Economic and Social
Business	2020	Supplier—technology; building-management systems and energy data	BSG5	Environmental
Community	2020	Project-based learning	CG1	Social
Funder	2019	Philanthropic—primary grant for sustainability	FS1	Economic
Funder	2019	Accelerator—participation grant and networks	FS2	Economic and Social
Funder	2018	European Commission body—prize in food sustainability	FS3	Economic
Funder	2020	European university—grant for research and data	FS4	Environmental and Economic

Table 1. *Cont.*

Stakeholder	Commenced	Role	Abbreviation	Sustainability Pillar
Funder	2021	European Commission body—grant for social-food-enterprise program	FS5	Economic and Social
Institution	2019	University 1—location of the experiment for receiving the building-integrated IVF and urban-farm business	IN1	Environmental, Economic and Social
Institution	2020	Research center—provider for integrated-data solution	IN2	Environmental
Institution	2018	University 2—Technical advisory for research and technological design for integration	IN3	Environmental
Institution	2021	University 3—International working group for business-model development and testing	IN4	Economic
Institution	2020	University 4—European partner for business-model development and market research to accelerate business creation	IN5	Economic

The sustainability pillars of the environment are social and economic, and are considered to provide a holistic, interactive, and balanced frame for designing, implementing and evaluating interventions designed to address the many challenges being faced in sustainability [29,30]. The pillars have emerged over time and are broadly attributable to the UN in 1992, with a debate about the parameters, definitions and approaches continuing today [31]. More recently, governance has been introduced as a pillar to improve the efficacy of sustainability, and in this case we assumed every stakeholder had some form of internal governance. Generally, the pillars are considered equal and interconnected; however, organisations and stakeholder groups may have a particular focus on or interest in one or all of the pillars and this can influence their strategies and participation in multi-organisational projects [32,33].

Multiple sources of funding were gathered, through European philanthropic and academic institutions. The conception of the UA experiment was based on research and meetings between initiating stakeholders, the social enterprise, (SE) Canguru Foods and IN3, who made application for the primary funding at the end of 2018. This application was approved by a funder (FS1), of EUR 225,000 released over 3 years, and formal commencement of the project occurred in the middle of 2019. Smaller funds were received from other funding sources, through an impact-acceleration-program grant and prizes awarded in food-system sustainability in Europe. Additional match funding was received through a research partner (IN2) and university consortium as the funder (FS4) for work specific to the technology development. Over the life of the project, the total costs including grants, sponsorship, labour, and technology amounted to EUR 400,000.

At commencement, the SE had no existing networks and required significant support from stakeholders to identify the location, team members, technology suppliers, business-administration support (legal and accounting), and to secure all project funding. Participation in the acceleration program, food-sustainability competitions, pitches, and conferences, expanded the access to stakeholders. The experiment ran for a total of 4 years and, following the installation of a building-integrated IVF, no further applications for funding were secured from venture capital, philanthropic or European grants, or bank financing. The project was closed in 2022.

The impact of the state of emergency due to COVID-19, and all the restrictions imposed, caused delays to project progress; however, this was not the main challenge. Contracts required for operating and executing the business model were not secured, resulting in the urban-farm business being unable to continue to operate.

2.2. Sustainability Progress and Environmental, Economic, and Social Pillars

The UA experimental design had a specific focus on three pillars of sustainability. Each pillar had a set of objectives for exploring the value and benefits offered. Primary funding aimed to research the environmental value of building-integrated IVF technology, a business objective to launch an economically viable urban farm and deliver social impact through creating a community of sustainability educated social entrepreneurs.

At its core, the project was grounded in the development of the vision which aligned with SDG 11, sustainable cities, and communities. The SE defined the project aim as 'we aim to integrate nature and technology to develop healthy living spaces for sustainable communities and commerce'. This purpose formed the foundation for all stakeholder engagement, communications, presentations, recruitment, and ways of working within the project. The following sections describe the progress made by the SE to demonstrate the UA experiments impact and value across the Section 2.2.1, environmental, Section 2.2.2, economic, and Section 2.2.3, social pillars of sustainability.

2.2.1. Environmental Sustainability

The environmental performance of the IVF system was a core aim of the experimental UA project. IVF systems are commonly credited as a solution for a number of sustainability issues facing cities, through shortened supply chains and increased resource-use efficiency through building-integration [34–37]. Beginning with a literature review on agricultural technology (ag-tech) for urban agriculture (UA), the SE sought to identify active and operating UA installations applying different combinations of ag-tech integrated with buildings. This revealed numerous benefits being suggested about UA that were not always supported with data from active UA installations [38]. However, the commercial application of controlled-environment agriculture, or greenhouses, integrated with building energy and climate systems, enables access to CO_2 and heat exchange through airflow ventilations [39].

The outcomes of the literature review informed the location of the IVF installation where building climate-system airflow ventilation was accessible. Many suggested benefits of the UA around the concept of producing food where it is consumed, reducing transportation and packaging. However, the environmental impact of IVF systems is increasingly queried, due to the high energy costs associated with the energy loads of operating lighting and climate systems [40–42]. Data on UA installations using IVF technology are limited and do not always support the advocated benefits.

A life-cycle assessment (LCA) was undertaken to examine the environmental impacts of supplying the final product, a functional unit of 1 kg of broccoli microgreens. The study compared a circular-supply model for the proposed business model with a linear-supply model, where the final product is transported to a retailer 10 kilometres off-site [43,44].

In order to evaluate the two supply scenarios against environmental performance, global warming potential, a climate-change indicator, was employed. This provided a measure of carbon footprint equivalent per kilogram (CO_2e/kg). Results presented the IVF as producing 7.5 kg of microgreens daily with the circular supply of 18.6 kg CO_2e/kg and linear supply of 22 kg CO_2e/kg, highlighting the value of reduced packaging, transportation, and use of biomass waste for campus compost.

Additionally, the LCA revealed that, regardless of the type of supply chain operating, electricity was the highest contributor to emissions, and when replaced with photovoltaic electricity, emissions were reduced by 32%. Combined with the circular-supply chain, access to renewable generation on campus brings many evidence-based,

environmental-performance advantages to an urban farm operating a building-integrated IVF system onsite.

Environmental performance of the integrated system needed to be tested, to identify the effect of condition control through IVF management while ensuring that maximum-yield production would support economic sustainability. The study on the installed IVF system [45] revealed that by using a single IVF and growing a single plant species, changes in control conditions impact the specific GWP of each kilogram of microgreens grown, and this increases from 3.3 to 63.3 kg CO_2e kg^{-1}. Altering IVF environmental conditions such as temperature, CO_2 concentration and hours of lighting exerts a wide range of control on the specific GWP of a single functional unit. The best-case scenario showed that 290.5 kg $week^{-1}$ of microgreens can be produced at 20 °C, using 24 h of light and maximum CO_2 concentration. Intensification is best for these types of IVF systems to achieve environmental performance and potential profit through high yields. When there is access to renewable energy, compost treatment and on-campus supply, the overall performance of the system is better.

2.2.2. Economic Sustainability

The business plan for the UA project was created around production of a vegetable sold directly to food retailers and food-service business on campus. In order to validate the economic sustainability of the future urban-farm business, a financial model, based on the operation costs and revenue from sales was generated. Multiple plant species and growth cycles were then tested in the model, to select the final crop and process inputs.

The final product of broccoli microgreens was scheduled to match client demand and produced for delivery in two forms: (a) trays for direct supply to an on-campus salad bar and (b) pots for retail. The figures presented below (Figure 1) were a best-case scenario, based on the highest volume of transactions, the lowest price per final product, and sales direct to food businesses as a white-label product. This rationale assumed a lower business cost to the SE, as the product marketing and branding was transferred to the food business.

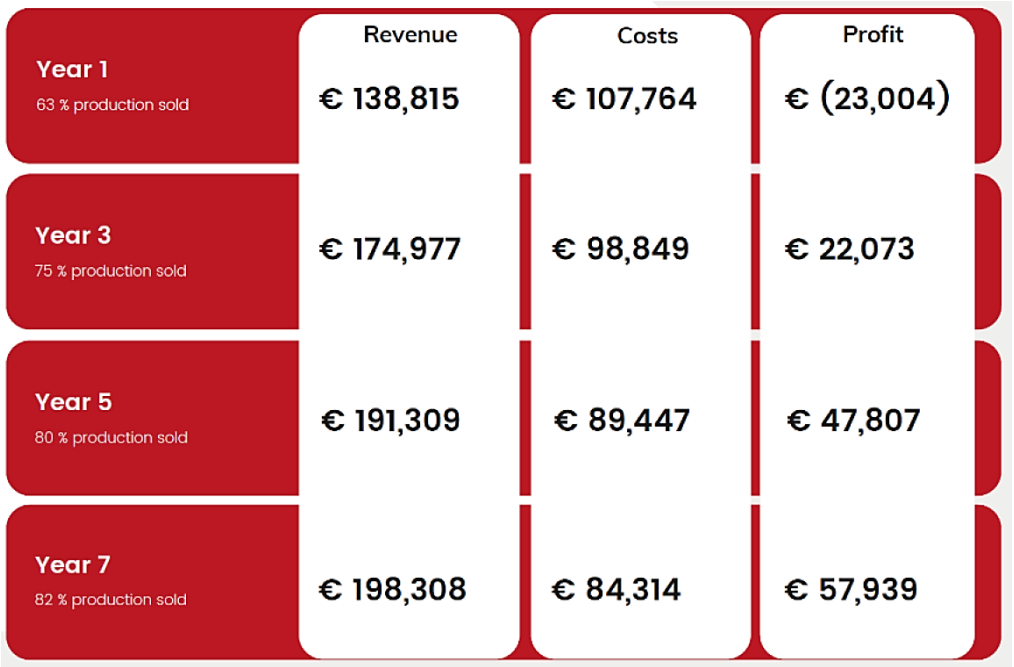

Figure 1. An outline of the financial model across two-year intervals, including revenue, costs, and profits.

Initial investments involved labour and technology costs for the system, preparation, and equipment. They were fully covered by the funds received from multiple funding sources. All inputs were related to microgreen-production operations of the urban farm; consumables such as packaging, seeds, nutrients, etc., and the utilities of electricity and labour costs of the farm-management team, were all based on the research undertaken with stakeholders. The production model assumed that all equipment for executing processes were in place, and that the team had been trained. From launch to reaching full capacity for the revenue targets and to achieving 85% of production, was assumed to take seven years to achieve. Based on verbal agreements, no rent was charged by the BU for the unused space, and electricity costs would be free for the first two years of the contract. Pricing plans offered broccoli microgreens for EUR 0.66 per pot or a box of 24 for EUR 15.84. A positive-profit position was expected in year three of operations, and can be found in the Supplementary Materials.

2.2.3. Social Sustainability

The UA experimental project was conceived to create an urban-farm business that aimed to provide a direct, positive social impact for the local community, staff and students on campus, and value for the end-user. There were two key engagement strategies deployed by the SE to achieve this: market research focusing on consumers, and demonstrated social impact.

The first was targeted market research, with data samples drawn from those people that worked or studied on the campus. This market research aimed to identify the university community's appetite for a sustainable leafy-green product, broccoli microgreens, and current consumption habits. The survey involved 135 participants, of which 93% were students (see Figure 2). A total of 75% were Portuguese, 70% female, 93% between the age of 18 and 26, and 74% did not have any special dietary requirements. More than 50% of participants ate fresh greens at home on a daily basis, whereas on campus they ate them only once or twice a week. This gave an indication that access to fresh greens on campus was limited and depended on which food businesses were offering these options. Those participants who ate fresh greens on campus recommended the salad bar offered by a food retailer as the best and quickest option for their busy schedules. A total of 75% of participants claimed they had healthier eating habits at home than on campus based on a lack of fresh, green food availability, price and time. These numbers were seen as an opportunity and as demonstrating interest in the BU community for access to a broccoli-microgreen product available on campus to support the community's desire for healthy food products (See Figure 3).

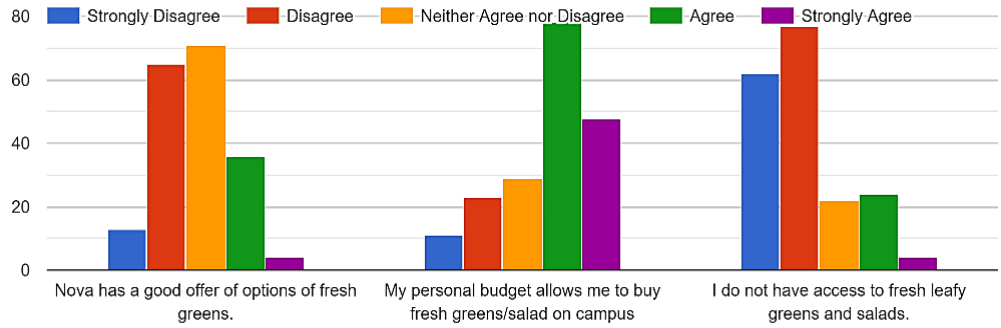

Figure 2. Results of the survey conducted. Results led the project leader to conclude that there was a consumer base without access to fresh greens on campus.

The second important element of the social-sustainability pillar was a comprehensive student-engagement-and-learning program of work. This was done through (a) work experience via an internship program, (b) offering the urban farm as a project for the students who were part of the social-consulting student club on campus, and (c) a social-food-enterprise program, which was run by the SE and was open to all. An operating

urban farm on campus provided a unique opportunity for project-based learning through studying a social enterprise, a business operation, data, and sustainability.

Over the life of the UA project, 12 work-experience opportunities were realized for people based in Portugal, Europe, Asia, and Canada. Interns executed work both on-site and in digital-work environments. Exit-interview data showed that work experience provided the student interns with an opportunity to apply their academic knowledge, build new skills, increase self-understanding, maturity, independence, and self-confidence in a real-world sustainability experiment in UA.

Furthermore, 15 social-consulting-student-club members participated in an experiential-learning process of consulting with the urban-farm management team from the SE. Key areas of focus or exploration were given to the club members, who worked in teams to deliver the agreed outcomes to the SE. These outcomes included: market research, marketing, and social-media strategies for the project. The students were also encouraged to reflect on their group dynamics and effectiveness in taking up roles, as part of the learning process.

Additionally, a social-food-enterprise program was run by the SE for those people interested in urban-farm businesses. The SE partnered with an environmental funder and offered 15 places for participants to undertake a blended-learning program online and in person in Lisbon. Participants reported in the program evaluation their gratitude for a rich learning experience. This included technical skills related to business analysis and marketing, combined with the social-skill enhancement of working in a team and consulting with clients in real time.

3. Materials and Methods

Having reviewed the positive performance of the studied project regarding the sustainability social, economic, and environmental-sustainability pillars, the main purpose of this paper was to study the influence of the governance-sustainability pillar on the outcomes of the experimental project overall.

Adopting an exploratory case-study approach [46], we conducted a qualitative document analysis and reviewed all available materials from the project files that were created during the life of the project. These included reports to funders and economic findings from the UA experiment, minutes of various stakeholder meetings, results of environmental research, and results of social research carried out in the community where the experiment was being undertaken.

3.1. Role Constellation and Analysis of UA Stakeholders

Role constellations depict a network of roles at a group level that connect, interrelate, and co-emerge with each other in relation to a task, project or shared endeavour over time [25]. Mapping a role constellation allows the various stakeholder roles to be made visible and an analysis of their interactions to be undertaken [47]. The study of the interrelatedness of the roles can be carried out across dimensions such as power and authority, economic advantage, history, risks, time spent connecting and outcomes achieved [15,48]. The analysis can be guided by the aims of those in the constellation and the disciplines involved, such as sustainability. We constructed a role-constellation map based on the stakeholders involved in the project and the aims of the project overall.

We then used several classifications to differentiate the stakeholders identified in the role-constellation map. First, we grouped the stakeholders as business, community, funder, or institution. Second, we identified the role function each stakeholder group had in the constellation. Third, we identified what contracts or agreements were in place between each of the stakeholders and the SE. Fourth, we applied the economic, environmental or social-sustainability pillars to each stakeholder group, based on their role (See Table 2).

Table 2. Outline of the seven factors and description as outlined in the European-governance study.

Governance Factor	Description
Vision and Mission	The organisation has a sustainability strategy, and it is used to provide guidance in decision making and implementation.
Policies	Offer guidance for social relations and influence the organisation's activities, plans and programs for sustainability.
Reporting	Provides information on the progress of implementation and alignment with vision and policies in the organization.
Communication	Mechanisms for communicating internally across all organisational levels and with external stakeholders.
Board of Directors	Established and functioning in the organisation, providing accountability and governance for sustainability strategy.
Sustainability Department	Specifically focused on policies, strategy, and initiatives in sustainability.

3.2. Analysis and Governance Factors

The governance factors used for analysis in the current study were identified and defined by researchers as important dimensions in sustainability governance in practice [13]. These factors are interrelated and, if used, can guide the structures and approaches for improved implementation in sustainability efforts. We used these factors to analyse the governance of the overall UA experiment.

Lewin's Force-Field Analysis

Lewin's field theory has been applied across multiple disciplines to understand behaviours at individual and group level [49]. In more recent years, it has morphed into what is commonly referred to as force-field analysis, and is applied extensively in change management [50,51]. The study of groups includes multiple disciplines dedicated to this endeavour, and is beyond the scope of this study. However, given the utility of force-field analysis, whereby influences can be categorized prior to, or discovered during, the examination of role constellations, we advocate that it is a useful approach to determine how groups are functioning and what their interactions are when undertaking UA experimentation [52]. Groups are influenced by their own internal forces such as social identities and groups norms and external forces related to factors such as economic, political, and social processes and change.

As our final step, we used a force-field analysis and examined the problematic and desirable elements of each of the seven governance factors identified in previous research and applied to this experimental UA project [13] (See Table 1), and we looked at how these influenced the interactions of the stakeholders. Using all available project documentation, we defined as problematic (P) governance factors that negatively influenced the project through how they were taken up by the stakeholder roles. We defined as desirable (D) those factors having a positive influence on the project in how they were taken up by the stakeholders. We first clarified if the factor was present. Then, to decide the classification, we asked, 'based on the factor, was the contribution of the stakeholder to the project desirable, problematic or both?'. For each governance factor for each stakeholder group with an agreement (verbal or written), we allocated the following scores in our force-field analysis: 0—the factor had no influence or was not evident; 1—the factor had either a problematic or desirable influence; 2—the factor had both a desirable and problematic influence on the project.

4. Results and Discussion

4.1. Role-Constellation Map

Role mapping of the different stakeholders captured the complexity of 27 organisational groups engaged across the project. Based on the categories given in Table 2, there were thirteen businesses, (yellow), six institutions (blue), five funders (purple) and three community groups (green), in Figure 3. The map showed that the SE1 needed to engage with a myriad of groups to ensure successful project design and implementation. The visual representation shows the SE1 in the middle of all the stakeholders, as a smaller circle. This could reflect both the criticality of the SE1 to the project and the smaller resource base the SE1 had to operate with. The 16 stakeholders with dotted-line circles did not have agreements in place with the SE1. Specifically, the dotted-line yellow business groups shows the food retailers or suppliers that had different commercial arrangements with the IN1, and therefore they could not be contracted by the SE1 directly, and this contributed to the project not proceeding. The map also suggests complementary skills, resources and potential ambitions that were not harnessed fully in this project, due to the stakeholders not engaging with each other.

The approach taken to develop partnerships for supply contracts, operating contracts, investment, and funding, demanded a single-point reliance on the SE1 human resources to reach existing/new audiences and secure required resources. This dependence on SE1 became more problematic over time, due to the expectations of different stakeholders of representing the entire project and all the stakeholders, as evidenced by the ongoing request to participate in online podcasts, presenting at conferences and online digital communication. While these activities promoted the value of the integrated urban farm, they did not directly contribute to the project implementation and, given the finite resources of the SEI, this was problematic.

Productive relationships and interactions between the stakeholders are fundamental to realizing the project benefits and contributing to sustainable solutions in cities [53]. However, there can be variation in the implicit and explicit objectives, motivations and understanding of the roles of stakeholders based on the societal, organizational, and personal influences that prevail at the outset and during the life of the project [54]. This role-constellation mapping could be created at the start of similar projects. Having a clear overview of all the stakeholders at the outset is important for initial and ongoing interactions in sustainable governance. Furthermore, this map could be shared or co-created with the stakeholders, who may not have visibility of each other's role in the project. Finally, an intervention, using the map at the commencement of the project, could open the dialogue amongst the constellation of stakeholders about the potential connections, challenges, and opportunities of working together. Role-constellation mapping provides a structure and process that may enable a less personalized or defensive view of the dynamics that are influencing the project or desired outcomes. We suggest that this could be achieved by using a role-constellation map, categorizing the role of stakeholders, and identifying key differences between the stakeholders and potential influences on them both at the project inception and ongoing, thereby supporting the likelihood of project outcomes that benefit the whole.

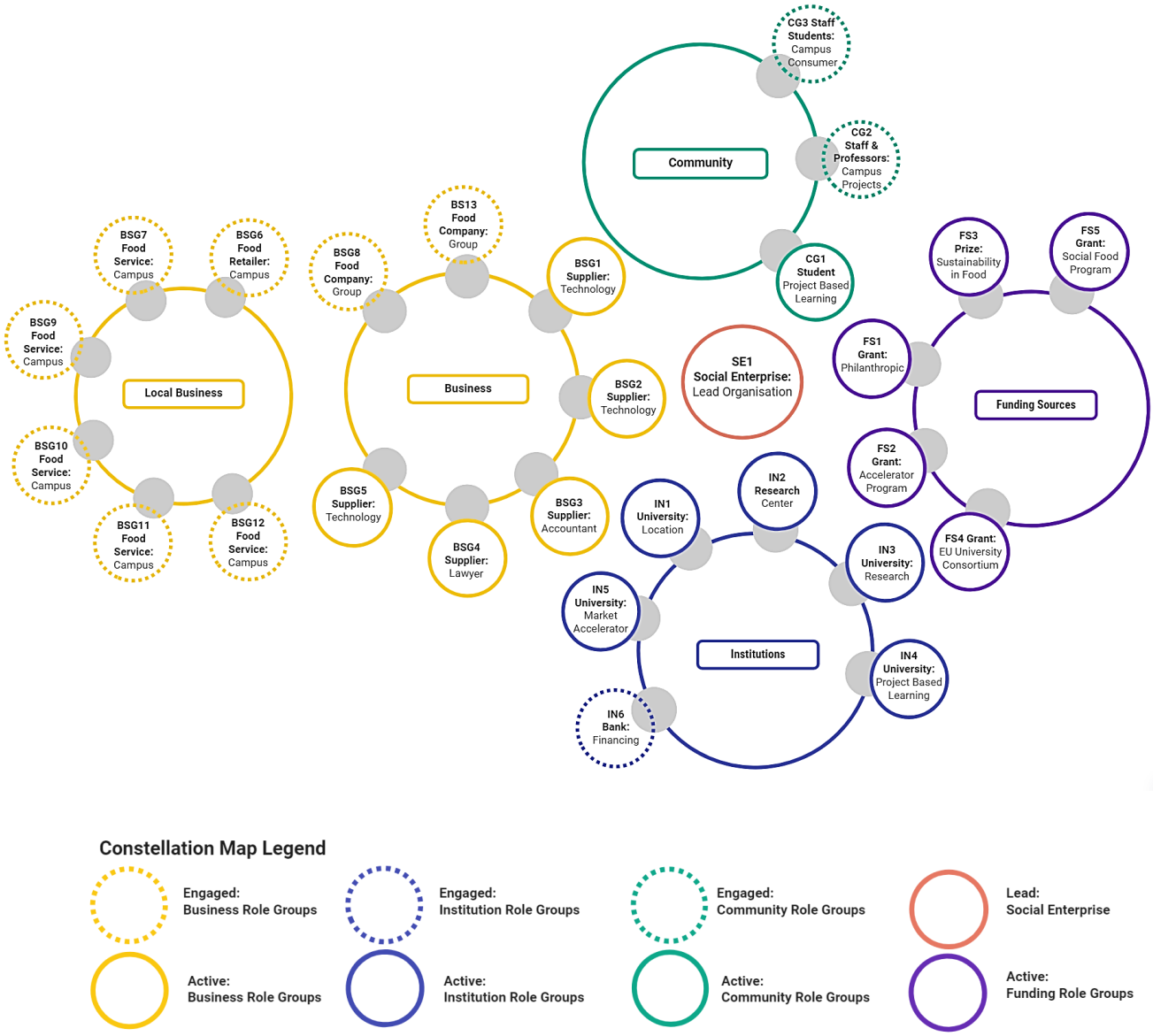

Figure 3. Role-Constellation Map depicting all stakeholders, the large circles are the groups of stakeholders based on business type and small circles, as defined in the Map Legend, are those stakeholders engaged or active in the project.

4.2. Force-Field Analysis and Governance Factors

The force-field analysis allowed an aggregated view of the influence of each sustainability-governance factor on the project. The scoring process allowed a non-polarized approach to the factor results, as we were interested in which sustainability factors had influenced this project and their interactions. Results are shown next for each governance factor and their links with other factors.

4.2.1. "Communications" Governance Factor

The "Communications" governance factor had the highest results, of 17 (D)/5 (P) (Table 3). This result suggests that communications were foundational to the project governance. While each of the key stakeholders had communications present and/or visible in its structures, it was determined in the analysis that it is important to be clear what this means to each stakeholder in terms of execution. Therefore, it is important to agree on the type, frequency and visibility of communications and the decisions made by stakeholders to ensure a consistency of practice that meets the project objectives. We found

that examples of desirable communication include stakeholders attending agreed meetings, responding to emails, executing planned actions on behalf of the project, and keeping each other abreast of any changes. Examples of problematic communication factors are cases when the actions did not occur or when stakeholders stopped communicating altogether. In previous research carried out to establish governance factors, communication was found to have the most centrality, meaning it was the most connected factor of the seven [13].

Table 3. Force-field analysis count of visible (X) desirable (D) and/or problematic (P) influences of stakeholder contributions to each governance factor.

Governance Factor	Vision and Mission		Policies		Reporting		Communications		Board of Director		Sustainability Department		Person in Charge	
Forcefield	D	P	D	P	D	P	D	P	D	P	D	P	D	P
SE1	X				X		X						X	
BSG1			X				X		X				X	
BSG2			X				X						X	
BSG3			X		X		X						X	
BSG4							X	X	X				X	
BSG5				X			X		X				X	
CG1			X		X		X		X				X	
FS1			X			X	X	X	X		X		X	X
FS2	X		X		X		X		X				X	
FS3			X	X	X	X	X	X						
FS4			X		X	X	X							
FS5	X			X	X		X			X			X	
IN1							X	X			X		X	X
IN2			X		X	X	X						X	
IN3			X		X		X	X	X				X	
IN4			X		X		X						X	
IN5			X	X	X	X	X						X	
Total	3		12	4	11	5	17	5	8	1	2		15	2

Two very successful UA organisations in North America, Gotham Greens [55] and Lufa Farms [56] provide good examples of the differences between communication in organisations and multi-stakeholder projects. Both companies were start-ups, each with two founders, and were successful in obtaining large-scale investment. While they have had to maintain communication with investors regarding market opportunities, they were not reliant on stakeholders to provide non-remunerated or voluntary input through human resources. In the current project, relying on stakeholders to offer resources and to communicate based on their own organisational drivers or culture was problematic. Role holders demonstrated different perspectives on communication through the way they behaved and took up their roles. Investing in resources to establish and ensure effective communication in multi-stakeholder environments would be a significant intervention to improve the outcomes of governance factors of projects in sustainability.

It is also important to differentiate between the 'marketing' or 'social media' output of the project from those internal communications for project governance. In an age of digital communications, project updates and news feeds cannot be confused with communication between stakeholders. Furthermore, there was an explicit expectation from some stakeholders that marketing of the project would be taken up by SE1, and that this would ensure all stakeholders were then associated with a sustainable project and viewed in a favourable light in the community.

4.2.2. "Person in Charge" Governance Factor

The force-field-analysis-results graph (Figure 4) shows that the 'person in charge' factor had a score of 15 (D) and 2 (P). The factors were similar for the IN1 and FS1. This could suggest that while there was a person that was identified as the 'person in charge' from the stakeholder organisations, more clarity regarding what was required from this role holder in the project was necessary. These results suggest that allocating a representative from stakeholder organisations does not always translate into the leadership culture required for the project. There may have been a difference in views on how these roles should be taken

up and/or what the project needed. Further resource constraints could also be a challenge for people in multiple roles. Gaining role clarity at the outset and attending to how the roles are experienced and taken up during the lifetime of the project would provide a useful intervention and support more effective sustainability governance.

Interestingly, in the two previous examples of successful companies operating in UA, each have had the same founders since inception. The 'person in charge' factor was consistent for the investors, staff and community for over 15 years [55,56]. Meanwhile, FarmHere was a UA project that started in a similar time period, transitioning to a company in 2011, when the project leader became a founder and CEO. In 2015, the founder 'stepped back' as the company direction changed. There were two more CEO changes that occurred in the next two years, and the company finally closed in 2017 [27]. While the investment returns were given as the reason for the closure in the press, it is interesting that in a market where UA faces many economic challenges, the two organisations that had consistent 'people in charge' have continued to operate and flourish. We would suggest that having a consistent take up of roles of those 'persons in charge' on a multi-stakeholder' project is equally important for consistency and ownership of the overall project outcomes.

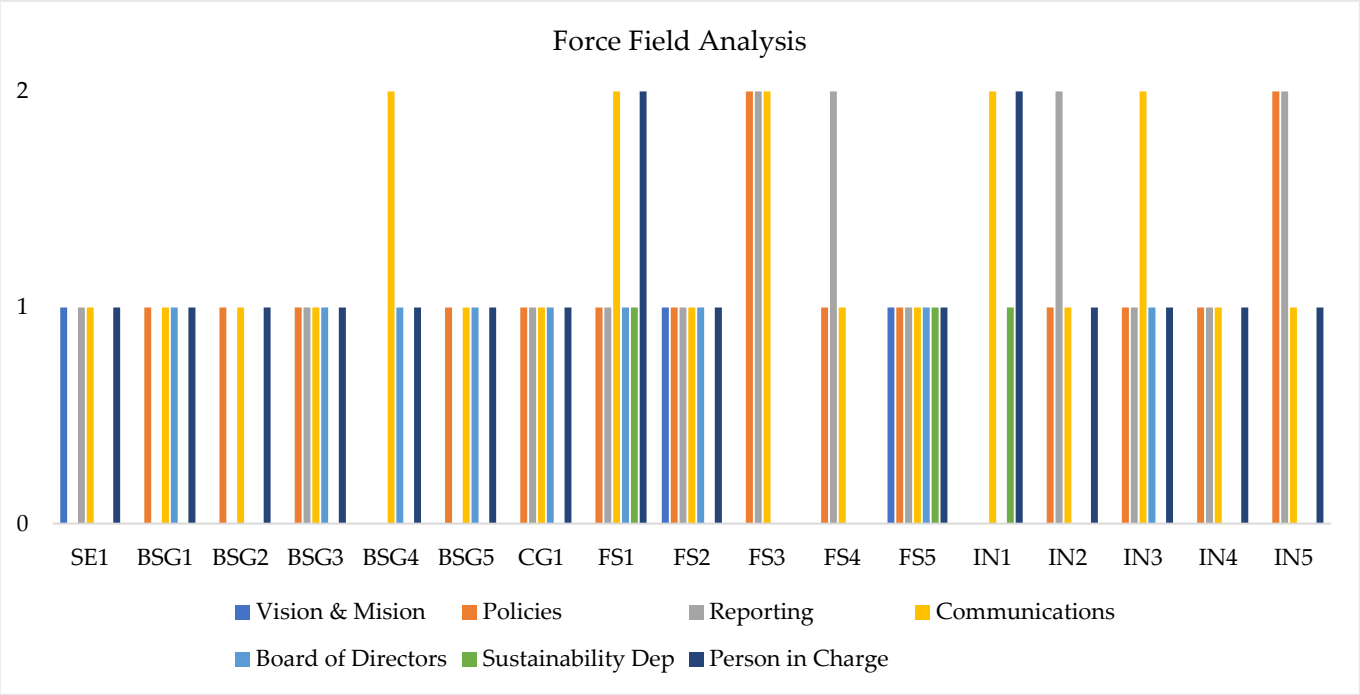

Figure 4. Total count of force-field analysis; desirable (D) and problematic (P) effect of stakeholder contributions to each governance factor. The graph range indicates zero as no effect on D or P, one as an influence on either D or P, and two as equal to both D and P, having influenced the force-field.

In this study, those stakeholders with a high 'person-in-charge'-factor score in Figure 4, FS1 and IN1, were supported by a 'sustainability department' and 'communications'. Those without a 'person in charge', FS3 and FS4, and 'policies' and 'communications', had heavy reporting requirements, and these put pressure on the SE1 in relation to time and human resources. This pointed to funders without a 'person in charge' relying on 'communications and 'reporting', rather than active engagement in leadership of the project. All funders were large complex organisations such as philanthropic or European organisations, or venture-capital funds. In such instances there were fuzzy and highly diluted internal responsibilities, rather than a 'person in charge', which was not required, based on internal policies.

4.2.3. "Vision and Mission" and "Sustainability Department" Governance Factors

While the factor "vision and mission" had a score of 3 (D) overall, a closer examination of the data reveals an important aspect of sustainable governance. It was found that only three stakeholders (SE1, FS2 and FS5) were involved in the crafting of and/or had visibility of the project's vision and mission. This potentially contributed to the lack of ownership of the project overall. Therefore, regardless of whether the stakeholder organisation has its own sustainability department or sustainability vision and mission, we suggest that the stakeholders in multi-organisational projects must be part of the process of agreeing on the vision and mission. This can then support accountability for the project on the part of the stakeholders, and provide guidance for decisions made by stakeholder organisations in relation to the project.

4.2.4. "Policies" and "Reporting" Governance Factors

The results for "policies" were 12 (D)/4 (P) and for "reporting" 11 (D)/5 (P), which revealed some curious outcomes in relation to the influence of these governance factors on the project. Most stakeholders had sustainability policies, and most had reporting requirements. The problematic aspect of these functions for the project was that there were no agreed shared policies for the project. Each of the funding stakeholders had different reporting requirements and, in some case, had no established reporting frameworks. This placed resource pressure on the SE1 to determine the reporting and measures for the stakeholders. In the case of smaller grants, these came with reporting frameworks and policies that were very labour-intensive, with regard to the funding amount, and added little value to the project overall.

4.2.5. "Board of Directors" Governance Factor

Governance and strategy are important functions in organisations and institutions, particularly when ensuring that sustainability is embedded [57]. Our analysis of this factor showed 8 (D) and 1 (P). This desirable score was influenced by the visibility of a board being in place for some stakeholder organisations and institutions that were part of this project. These boards, while influencing the stakeholder participation in the project, did not have direct input on the project. A governance structure and plenipotentiary authority from the various stakeholders was not put in place for this project. We suggest that shared governance across the stakeholders would support alignment of vision, objectives and key decision points in the project [58]. Relying on the SE1 to do this on behalf of large organisations and institutions was problematic, and contributed to the project closure, whereby key decisions and contracts could not be obtained with critical stakeholders.

The business group of stakeholders demonstrated a desirable influence on the project. Agreements were in place with all five, with a 'person in charge' (5 D) managing the relationship, 'communications' (5 D/1 P), 'policies' (3 D/1 P) and low requirements for 'reporting' (1 D). In all cases the BSG stakeholders had a supply agreement with SE1 to deliver equipment or services for the technology development based on the project work packages. Funding arrangements differed across the agreements, with direct purchase, sponsorship, and matched-grant funding, which means a financial transaction was taking place between organizations. This result indicates an advantage to having a 'person in charge' and desirable 'communications'.

4.3. Project Culture and Governance-Factor Interactions

It is widely understood in the literature that the workplace or organisational culture strongly influences performance. In particular, leaders or the 'person in charge' are known to have a particular effect on the culture that is shaped. Specifically, aspects such as 'what leaders pay attention to', 'measure' and 'reward' lead to certain behaviours being enacted in organizations [59]. While some dimensions of culture are visible, some of the most influential are implicit, and are not always easy to quantify. In relation to the seven factors of governance, we found that the two biggest influences on this project's culture

were 'person in charge' and 'communication' and their interaction. These factors strongly influenced 'how things get done around here' at both visible and implicit levels. Therefore, the criticality of the interaction of these two governance factors and how this influenced the project reinforces the idea of all stakeholders benefiting through communication of each other's role and the visibility of the leader or 'person in charge' on behalf of the particular stakeholder in this project.

Furthermore, while 'person in charge' was understood in terms of each stakeholder, and the SE1 had a CEO, it became very problematic when key decisions needed to be taken by 'the person in charge' of stakeholder groups in relation to the project if they were not available due to the pressures of their other organisational roles. These dynamics also sent strong implicit messages to the other stakeholders in relation to what the 'culture' or acceptable behaviours were regarding the project. This lack of clarity and sometimes lack of communication between the various 'person(s) in charge' of the stakeholders was not transformed during the life of the project. This reinforces the need for a governance structure that is clearly defined from the outset, with a review of roles and input occurring throughout.

The remaining governance factors, while influencing aspects of the project operations, did not strongly influence the project culture. This was primarily due to these factors being dimensions of the stakeholder organisations, rather than adapted or designed for this project. Therefore, they were more a reflection of how the stakeholders operated than the impact they had on the project itself. However, while not as influential, they also needed to be designed or clarified specifically for the project in terms of the 'vision and mission' of the project and the structures and processes that would support the sustainability of the project.

4.4. Limitations of the Analysis

The main limitation of this study has to do with the potential replicability of results. This study was based on one project with multiple stakeholders, and could not be compared with the results of governance in other projects, due to an absence, to our knowledge, of published literature on this topic. Nevertheless, through the analysis of other active cases around the world presented previously, we found evidence that in any UA project, particularly those with multiple stakeholders, paying attention to governance factors such as person in charge and communication, is important and global. How projects are governed strongly influences success or failure.

Given that there are few case studies reporting transparently on the causes of failure in the implementation of projects, future studies could use factors to both analyse and implement appropriate governance factors. As shown here, while costs and funding models do have a strong influence on projects, it can be simplistic to say that this is the main or only cause of failure or of not realising sustainability benefits.

5. Conclusions

This experimental UA case study provided a unique opportunity to examine the influence that seven governance factors and their interactions had on the project culture and, ultimately, the project outcomes. Moving beyond economic measures or challenges that are understood as common in UA projects, we were able to provide a method of analysis and results that contribute to understanding the less tangible dimensions of sustainability projects such as governance.

Through the case study we were able to conclude that all multi-stakeholder projects must carefully address governance in the design of any sustainability project or experiment, regardless of location. We showed that having a strong business plan with credible expectations for future income, access to funds, a positive environmental performance compared to alternative products, and social co-benefits, are necessary but insufficient conditions to ensure successful implementation.

Cultural alignment and shared objectives among the overall stakeholders, as evidenced by the forces identified in the seven-governance-factors analysis, contributed to a culture

that did not demonstrate shared ownership, and was the main reason this project did not proceed. Relying on SE1 to manage this on behalf of the 27 stakeholders was unrealistic. The culture was most influenced by the 'person in charge' and 'communication' factors of governance and their interaction. These specific dimensions in both project design and implementation need to be attended to when undertaking sustainability projects.

Although each of the stakeholder groups may have contributed to separate governance factors in place internally, we suggest that it is important to ensure that these are implemented for the project overall. In particular, when there are multiple stakeholders, a board structure of representatives with plenipotentiary authority would ensure vision alignment with key decisions taken by 'the person in charge' for each stakeholder, and would be communicated in a timely manner. Shared objectives could also be established at the outset, and used to monitor the health of the project as it proceeds.

Ensuring investment in the governance pillar for UA projects is critical to develop performance culture and meet objectives to ultimately address sustainable-development goals for the preservation of our futures.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/su15043817/s1. The supplementary files include an Excel with graphs and data for role-constellation map and force-field analysis; File Name 'Supplementary Materials—Role Constellation Data Final'.

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