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Scaffolding Transition Pathways: Integrating SES Resilience as a Dialogic Tool for Community-based Co-Design

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Paper title Scaffolding transition pathways: Integrating SES resilience as a dialogic tool for community-based co-design

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Abstract: This paper addresses a challenge for Transition Design (TD): how to make long-term, systemic frameworks tangible and actionable in small-scale, community-led practice. We introduce and evaluate the preliminary results of a methodological framework that scaffolds TD backcasting with seven principles of Social-Ecological Systems (SES) resilience for urban gardens. Grounded in a community garden case study in Shanghai, we analyse data from semi-structured interviews and a co-design workshop to evaluate this method in practice. Our findings reveal that this method functions as a dialogic tool, enabling participants to diagnose systemic issues, negotiate trade-offs, and co-create near-term actions with a longer-term vision. The paper provides a critical analysis of the new tool, including its differential effectiveness during visioning versus action planning and presents a theoretical framework for further replication and iteration. Ultimately, this research aims to contribute a theoretically-grounded and empirically-tested method for structuring co-design processes aimed at fostering community-led sustainable transitions.

Keywords: Transition Design, Social-Ecological Resilience, Community, Co-Design

1. Introduction

Cities today face intertwined social-ecological crises that demand transitions toward more sustainable and just futures (Berkes et al., 2008; Ceschin and Gaziulusoy, 2019). In response to these challenges, the need for regenerative, adaptive, and inclusive strategies has become increasingly evident (Baron, 2025a). In this context, the field of Design for Sustainability (DfS) has evolved significantly over the past few decades, responding to growing concerns over environmental degradation, social inequity, and the limitations of conventional design paradigms (Rocha et al., 2019; Ceschin and Gaziulusoy, 2019; Campbell, 2023; Baron, 2025). Within this evolving field, there is a growing recognition that meaningful transitions are often nurtured at the community scale, manifesting through tangible, place-based interventions.

Community gardens, as a kind of local social-ecological systems, have emerged globally as vital micro-infrastructures for such change. These places are micro-infrastructures for soil, food, and habitat, but also forums where neighbours negotiate rules, care, and futures (Guitart et al., 2012; Chen et al., 2023, Campbell, 2021). However, the long-term viability of these gardens is often fragile, caught between fluctuating participation, resource instability, and pressures from urban development (Chen et al., 2023; Campbell, 2026). This reveals a critical challenge: moving from isolated, project-based activities to deep, sustained lifestyle and systemic transitions (Baron & Ghelich Khani, 2021).

From this vantage, Transition Design (TD) is timely (Irwin, 2020). TD is currently nourished by multiple theoretical streams, including sustainability science, complex adaptive systems, system innovations and socio-technical transitions theories, and social ecology, etc. (Gaziulusoy & Öztekin, 2018). The emerging Transition Design framework, increasingly advocated for urban sustainability, integrates four key domains of knowledge, action and self-reflection (Irwin, 2015). This pluralism has produced a multi-source landscape that is both a strength and a challenge: there is no single foundational theory (Gaziulusoy & Erdoğan Öztekin, 2018). What is needed now is a more rigorous theoretical grounding that connects these streams into testable, practice-ready constructs (Lähteenoja et al., 2023). Yet, despite its systemic ambition, TD often struggles to gain traction in practice, a challenge noted in empirical workshops where participants find systemic visioning and backcasting processes particularly difficult over a long-term time span (Irwin, 2020). Within this, the role of design in transitions still requires empirical evidence (Lähteenoja et al., 2023). Much published work remains exploratory or speculative, which is valuable for opening space but thin for consolidation at the point of interdisciplinary intersection. These conditions suggest a productive next step: systematic early adoption in practice to generate empirical inputs that test TD's core assumptions and, from that, drive the development of practice-oriented models and tools. This process, if designed well, has the potential to move TD beyond inspiring narratives toward a body of practical frameworks and actionable principles that meaningfully inform research, education, and practice across sustainable design and transition studies.

Social-Ecological Systems (SES) resilience adds an ecological lens and a set of principles that help transition design processes move from theoretical to grounded and actionable. Originating from ecological and systems sciences, the theory of SES resilience can be positioned to fill this gap by providing a robust framework for understanding the dynamic interplay between human and natural systems, and their capacity to adapt and transform in the face of change (Holling and Gunderson, 2002; Walker et al., 2004). Central to its operationalisation are the seven principles for enhancing SES resilience (Figure 1), which distil complex systems theory into a set of actionable guidelines (Biggs et al., 2012). It then offers the concrete, practice-ready constructs and ecological criteria needed to ground the Transition Design process into building resilient futures (SRC, 2015). To do this, we aim to situate a TD backcasting process, adapted from a TD approach designed by Kossoff et al. (Figure 2), to design transition pathways within the seven principles for enhancing SES resilience. Our central proposition is to integrate these frameworks together. By

using the seven SES resilience principles as a theoretical scaffold for the TD backcasting process, we create a more robust and grounded approach for participatory sustainable design. TD backcasting provides an approach for developing transition pathways from a desired future back to the present (Irwin, 2020; Kishita et al., 2024), while the SES principles infuse each step of that journey with systemic, ecological, and governance-related perspectives. As a preliminary approach, we grounded this theoretical model in a pilot case study in Shanghai, China, which included interviews and a pilot co-design workshop in a community garden. We chose this pilot site because after a decade of development, it faced the need to evolve its governance structures and community engagement models to ensure its future resilience. This *transitional moment* provided a tension-filled ground to pilot our integrated approach and observe in what ways it supports diverse stakeholders to articulate shared problems and co-create future pathways.

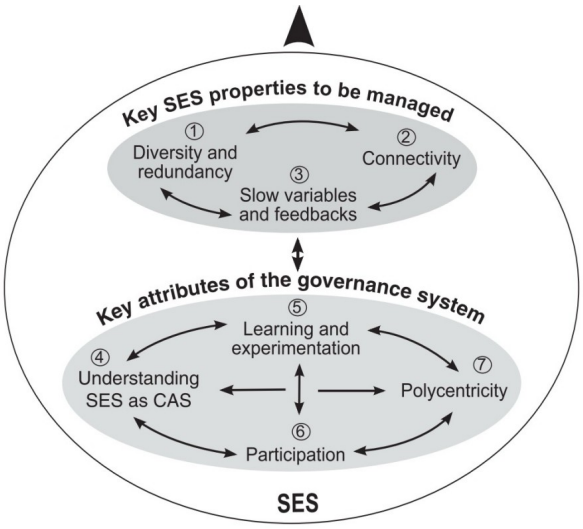

Figure 1 The seven principles that relate to generic SES properties to be managed and those that relate to key properties of SES governance (Biggs et al., 2012).

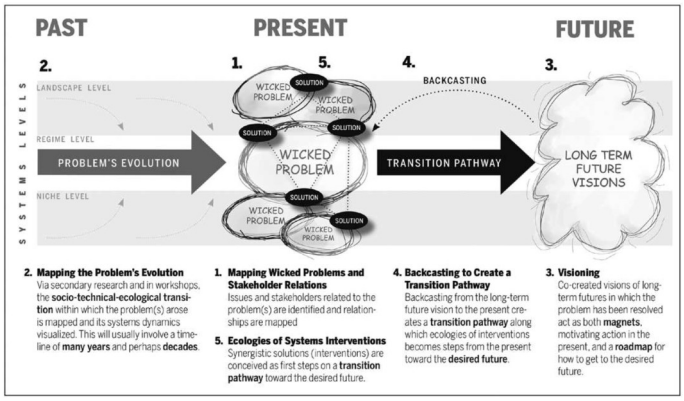

Figure 2 Overview of a backcasting-led process in Transition Design to create a transition pathway, designed by Kossoff et al. (2022, p. 101).

The contribution of this paper is threefold. Firstly, we articulate TD's evolving theoretical base and argue for empirically-driven evidence development as a near-

term priority; this positions our practice as a site for testing and refining TD's underlying assumptions. Secondly, we demonstrate how the SES seven-principles framework strengthens the operationalisation of TD practice by guiding co-designers to consider ecological structure, governance processes, and learning scaffolds, thus empirically landing TD theory in community challenges. Thirdly, we offer early evidence from a case study in Shanghai, China, to formulate a set of insights for future practice and research on local small-scale interventions. The discussion offers preliminary insights into how participatory processes can be designed to bridge scales, translate complex knowledge, and foster a collective capacity for stewarding social-ecological resilience. In doing so, we directly address the DRS (Design, Research, Society) Transition Design theme's core concern: "how can design facilitate the difficult, yet essential, work of building consensus, navigating conflict, and learning to coexist sustainably in a world in transition?"

2. Theoretical Framing: Transition Design through an SES Resilience Lens

This research is situated within the ongoing epistemological shift of design from a discipline focused on the creation of artefacts to one increasingly engaged with facilitating systemic, long-term societal transformations. This shift is a direct response to the prevalence of wicked problems, which include complex, ambiguous, and deeply entangled socio-ecological challenges, such as climate change and social inequity, that defy linear, solution-oriented approaches (Rittel & Webber, 1973; Buchanan, 2010; Baron, 2025). To address such problems, design must move beyond treating symptoms and instead engage with the underlying structural roots and lifestyle paradigms from which they emerge (Baron & Ghelich Khani, 2021; Kossoff, 2024). This theoretical framing establishes the rationale for integrating TD and SES resilience, arguing that TD's process-oriented approach can be effectively grounded by the actionable principles of SES resilience, creating a robust methodology for community-based sustainable transitions.

2.1 Applying Transition Design at the Community Scale

TD has emerged as a design-led approach specifically formulated to address complex, "wicked" problems by facilitating long-term, systemic societal transformations (Irwin, 2015; Kossoff et al., 2022; Gaziulusoy & Erdoğan Öztekin, 2018). A central method within TD is backcasting, a foresighting technique that begins with a co-created, desirable future vision to stimulate new pathways of thinking and action that are not constrained by present-day paradigms (Irwin, 2020; Kishita et al., 2024). However, its practical application reveals two critical gaps at the community level. First, TD faces a methodological challenge of abstraction, as community participants often find the cognitive task of imagining long-term futures difficult, highlighting the need for tangible tools to structure these conversations (Irwin, 2020; Coops et al., 2024). Second, there is a gap in the scale of application. Much of the empirical evidence for TD is derived from broad-scale, city- or national-level interventions, such

as the Visions and Pathways 2040 project in Australia (Gaziulusoy and Ryan, 2017), with a scarcity of validated practices for applying it at the small-scale community level where the need for grounded tools is most acute (Hyysalo et al., 2019).

2.2 SES Resilience as a Methodological Interdisciplinary Bridge

This study proposes that the seven principles of SES resilience (Figure 1) can serve as the vital methodological bridge to span these gaps. Originating in ecological science, SES resilience provides an analytical framework for understanding how socio-ecological systems (like a community garden) absorb disturbances, self-organise, and maintain their core functions through adaptation and transformation (Holling, 1973; Folke, 2006). The integration of design and SES resilience also provides the theoretical foundation for our methodological approach. This project builds on previous work like Anderies (2014) whose research conceptually integrates SES resilience, robustness engineering, and institutional analysis to propose a multi-scale, feedback-oriented theoretical design framework, arguing that effective design of the built environment must actively accommodate and guide the inherent self-organising dynamics of complex systems. Furthermore, some cross-cutting themes, such as diversity and learning, that connect resilience theory to urban design, were identified by Quigley et al. (2018). While these works articulate the theoretical agenda, a gap remains in the methodological 'how' of translating these themes into generative tools for participatory practice. By employing the seven principles of SES resilience (Biggs et al., 2012), we respond to the call for empirical operationalisation and create an interdisciplinary bridge between scientific and experiential knowledge. In essence, this approach moves resilience thinking from a passive analytical lens to an active, generative tool within a creative design process. The seven actionable principles distilled by Biggs et al. (2012) (Figure 1) offer a theoretically optimal response to TD's methodological challenges, resolving its inherent abstraction by translating the nebulous goal of 'sustainability' into concrete, tangible "anchor points" (SRC, 2015). They are practice-ready constructs that provide a systematic way to diagnose challenges, generate visions, and evaluate action plans. To illustrate this, Table 1 details how the mechanisms of these seven principles within urban SES can be systematically translated into tangible manifestations for community-scale design.

Table 1 The seven principles for enhancing SES resilience and their translation into community-scale design contexts (adapted from Biggs et al., 2012; SRC, 2015)

Principle	**Mechanism in Urban SES (Macro/Meso Level)**	**Manifestation in Community-Scale Design (Micro Level)**
Maintain diversity and redundancy	Enhancing system "insurance" through functional redundancy and response diversity (components reacting differently to shocks).	Cultivating diverse ecological elements (e.g., polyculture) and engaging residents with varied skills so the community project continues functioning if one element fails.
Manage connectivity	Optimising network linkages to facilitate resource sharing and recovery, while maintaining modularity to prevent localised disturbances from rapidly spreading across the entire system.	Balancing the local project's integration with wider city networks (e.g., institutional partnerships) against the risk of over-dependence or losing community autonomy.
Manage slow	Monitoring slow-changing underlying drivers	Tracking vital but often overlooked metrics, like soil

variables and feedbacks	(e.g., land degradation, demographic shifts) and managing feedbacks to prevent irreversible regime shifts (crossing critical system thresholds).	nutrient cycles, cumulative community trust, and volunteer fatigue, to avoid sudden breakdowns in grassroots operations.
Foster complex adaptive systems (CAS) thinking	Recognising that SES are characterised by unpredictability, non-linearity, and emergence; shifting mental models away from “command-and-control” management.	Treating the community initiative as a living, self-organising entity, fostering a mindset that embraces uncertainty and flexible adaptation over rigid, one-size-fits-all planning.
Encourage learning	Treating management as an iterative process of testing hypotheses (learning-by-doing) and integrating diverse knowledge systems to navigate constant, unpredictable change.	Creating a safe environment where members can test new horticultural or social ideas, share local knowledge, and continuously adapt practices based on outcomes.
Broaden participation	Actively engaging diverse stakeholders to build trust, establish shared understanding, uncover novel perspectives, and grant legitimacy to decision-making processes.	Actively reducing barriers to entry for various resident groups to ensure inclusive decision-making and foster a deep sense of collective ownership over the space.
Promote polycentric governance systems	Establishing multiple, nested, and interacting centres of authority across scales to match governance to the scale of the problem and enhance institutional redundancy.	Distributing power away from a single manager by empowering collaborating sub-groups to make autonomous decisions at their respective levels.

2.3 Research Proposition: A Synergistic Framework for Co-Design

We propose a synergistic model where these principles act as a theoretical scaffold for the TD backcasting process. This integrated framework, in turn, has profound implications for the designer's role. A central challenge in co-design for sustainability transitions is to move beyond superficial participation toward genuine co-creation and shared responsibility (Hyysalo et al., 2019). The designer has evolved from a traditional "expert" to a “bridge-builder”, who navigates the dialectic between expert design and diffuse design (Manzini, 2015; Campbell, 2015 & 2017; Lähteenoja et al., 2023; Baron, 2025a). Our proposed TD+SES framework facilitates this refined role by equipping the designer with substantive, diagnostic questions derived from the SES principles, providing a scaffold to skilfully introduce a systemic lens while honouring participants' experiential knowledge. This shifts the focus from extracting solutions to building the community's collective capacity to think systemically. This study, therefore, sets out to empirically test this synergistic model and the refined role of the designer within it in community-led transitions.

3. Exploring TD+SES in Urban Community Gardens: A Case Study

The aim of this study was to test the applicability of TD and SES resilience principles in a community-scale, nature-based context. If the research is exploratory and aims to produce preliminary qualitative insights on the topic, a case study is a suitable methodology for the initial phase of the research (Yin, 2014). Specifically, it examines how transition design approaches can be implemented in different urban contexts and how SES resilience principles can help enhance the effectiveness of sustainable transitions. The case study provides the textured empirical grounding necessary to observe the nuances, tensions, and affordances of our proposed transition design approach in a real-world setting. The case study was informed through interviews and

workshops (explained in depth below), the ethics clearance for the study was granted by the University of Auckland Human Participants Ethics Committee approval number [UAHPEC29089]. All interviews, observations and workshops were undertaken with the informed consent of the participants.

Our research was guided by the central question: *How can the integration of SES resilience principles with a TD backcasting process inform strategies for community-led sustainable transitions?*

3.1 Case Study Background

The "Garden A" case study, is a 2,200 m² public community garden located in an open city block in Shanghai (Figure 3). The garden transformed a previously underutilised, walled-off corporate site into a vibrant, community-driven social space featuring functional zones for permaculture, vegetable plots, and educational activities, all centred around a repurposed shipping container that acts as a community hub (ThePaper, 2023). This site was deliberately chosen as a critical case for this study because after a decade of successful operation and significant social impact, Garden A is at a transitional crossroads. It now faces persistent challenges, including sustaining resident participation and securing financial viability, which necessitate a reshaping of its governance and engagement structures. This context makes it a representative case of the complex governance, participation, and ecological maintenance issues that community-led sustainability initiatives face. It provides fertile ground for piloting an approach designed to navigate such long-term transitions and facilitate dialogue among its diverse stakeholders.

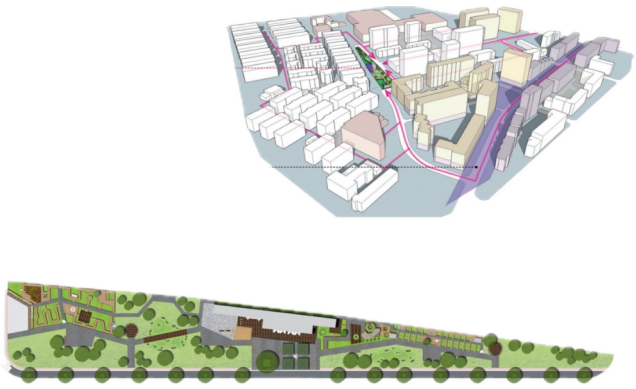

Figure 3 The site and landscape map of Garden A (Liu et al., 2017)

3.2 Data Collection and Analysis

Data collection took place during 2025 and included 3 approaches (Figure 4):

3.2.1 Desktop Research

We began by conducting a thorough review (Bowen, 2009) of public policy documents, media reports, academic literature, and organisational materials related to Garden A. This allowed us to map the site's developmental history, governance

arrangements, socio-cultural background, and links to wider urban programs, providing an essential foundation for the subsequent fieldwork.

3.2.2 Semi-structured Interviews:

We then conducted two semi-structured interviews with key informants (Patton, 2014) including the garden coordinator, a resident member of the co-building group, and a primary management staff member. These interviews were designed to elicit detailed accounts of the garden's daily operations, internal dynamics, and perceived challenges to its long-term SES resilience.

3.2.3 Co-design Backcasting Workshop:

The central component of our fieldwork was a co-design workshop that served as a site to pilot and observe our integrated new TD+SES approach (Figure 5). The workshop's design (Figure 5) was adapted from a backcasting transition pathway design process developed by Kossoff et al. (2022, p. 101) (Figure 2). Although the participant sample was necessarily small, it was purposefully selected (Patton, 2014). Participants were directly or indirectly involved in the garden's daily activities and had a general level of knowledge regarding one or more aspects of garden planning and sustainable management. The workshop included seven participants: the garden coordinator, three primary management staff members, and three resident members of the co-building group. The ages of the resident members range from their 20s to 70s. The criteria for participant selection ensured the scientific validity and feasibility of the workshop's outputs, providing rich, situated insights into everyday practices, tensions, and expectations. Prior to the main study, we conducted pilot testing with a visioning horizon set to 2040. However, feedback from participants and organisers indicated that this timeframe was excessively long for a community-based initiative. Non-expert residents struggled to develop strategic, systemic narratives grounded in their cognitive models, making it difficult to backcast actionable near-term steps. Consequently, informed by this pilot testing and literature on community-level transitions (Hyysalo et al., 2019), we recalibrated the target horizon to 2030 for the formal workshop.

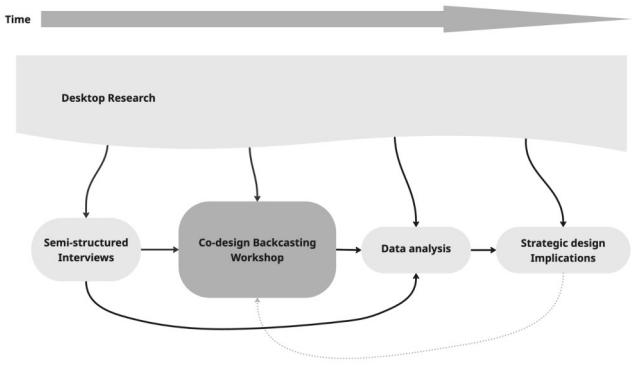

Figure 4 Research Process, diagram by authors.

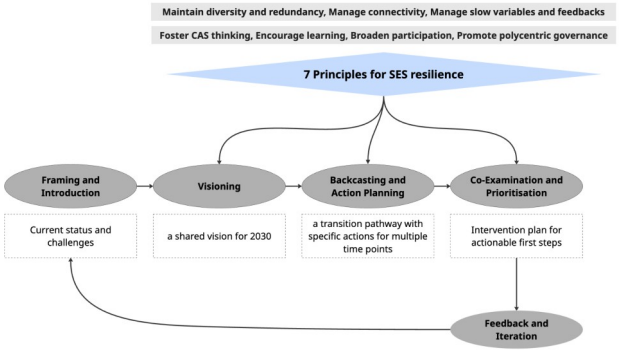

Figure 5 The TD+SES Resilience Framework for designing a transition pathway (author), adapted from the seven principles model of enhancing SES resilience (Biggs et al., 2012; SRC, 2015) and a backcasting-led process by Kossoff et al. (2022).

The workshop unfolded through a carefully facilitated, multi-stage process:

- ***Framing and Introduction****:* The designer, acting as a facilitator, introduced the workshop's background. This was followed by a clear presentation of the core concepts: the seven principles of SES resilience and the transition pathway design process, with time allocated to check participants' understanding and establish a shared conceptual ground.
- ***Visioning (to 2030):*** The facilitator used illustrative examples and prompts to help participants imagine a desirable, long-term future for the garden. Participants then worked together to map a collective vision for the year 2030, explicitly using the seven SES principles as generative guides for their aspirations.
- ***Backcasting and Action Planning:*** Working backwards from the 2030 vision, participants brainstormed and designed specific actions for multiple time points: 5 years from now; next year; and now.
- ***Co-Examination and Prioritisation:*** Under the facilitator's guidance, all participants collectively reviewed and revised the proposed actions. Similar actions were clustered, their priorities were discussed and negotiated, and the results were synthesised into a coherent intervention plan with actionable first steps.
- ***Feedback and Iteration:*** The workshop concluded with a feedback session where participants voluntarily shared their reflections on the process itself. This feedback was documented to inform the iteration of the workshop design for future research.

Figure 6 Backcasting and Action Planning phase, photo by author.

Figure 7 Co-Examination and Prioritisation phase, photo by author.

The data, comprising interview transcripts, field notes, and workshop artefacts (such as maps, vision narratives), was analysed using thematic analysis (Braun & Clarke, 2006). This involved an iterative process of coding the data to identify patterns and synthesising these into overarching themes. This analysis allowed us to move beyond a simple description of events to critically interrogate how the integrated TD+SES process functioned as a mechanism for dialogue, enabling us to distil the foundational insights for community-led transitions.

4. Findings

Our analysis of the interview and workshop data yielded a multi-layered understanding of Garden A's operational dynamics, revealing how the integrated TD+SES approach functioned in practice. The findings are organised into two main themes. The first details the inherent challenges of sustaining community participation at the garden, which sets the context for our intervention. The second characterises the application of our transition design approach, demonstrating how the seven SES principles acted as a scaffold for diagnosing problems and co-creating transition pathways.

4.1 The Challenge of Sustained Participation

Desktop research and interviews with the garden's core management team revealed a fundamental tension between the garden's ambition for community self-organisation and the realities of maintaining long-term engagement. Established in 2022, the garden's "Co-building Group" was founded on the principle of community-led governance, aiming to empower resident members to participate not just in cultivation but also in planning, decision-making, and sustainable development.

However, the interview with the garden coordinator revealed a persistent challenge: moving participants beyond passive consumption of activities toward proactive ownership. The coordinator described a clear "ladder of participation", where residents transition from casual consumers to active volunteers, and finally to deeply engaged "Co-building Group" members who act as partners in the garden's future. While systems like points-based incentives exist, they have had limited success in fostering a deep sense of self-organising consciousness. The coordinator noted that

activities often have "low sustainability; some are held once and then disappear," failing to spark intrinsic motivation. This challenge manifests in two key areas: first, a participation imbalance skewed towards passive, parent-child recreational activities, lacking broader adult engagement in co-creation; second, an ecological maintenance gap, where installed infrastructures (e.g., rainwater barrels) degrade due to the absence of long-term, skilled stewardship structures.

4.2 Characterising the TD+SES Resilience Tool in Practice

The co-design workshop served as a pilot to test our integrated approach. The findings demonstrate its effectiveness as a generative tool for pathway design while also revealing important nuances regarding its application in a community garden context.

The seven SES resilience principles proved highly effective as a structured framework for both diagnosing current issues (including authentic participation) and imagining future possibilities. First, the co-created vision for 2030 depicted garden A that was not only more ecologically vibrant but also served as a central hub for intergenerational learning and community wellness and self-organisation. A crucial first step was the facilitator's "translation" of theoretical principles into accessible, question-based, real-life prompts (Baron, 2025b). This act of translation was vital for grounding the theory in the participants' lived experiences. To demonstrate how this translation process directly supported the generation of concrete interventions, Table 2 provides specific examples linking the facilitator's prompts to the actionable steps co-created by participants. During the *visioning* and *backcasting* phases, they guided participants to think systemically, generating a comprehensive spectrum of ideas that encompassed ecological infrastructure (e.g., rainwater recycling system, nature observation groups), community programs (e.g., a "natural canteen", intergenerational photography exhibitions), and governance enhancements. For instance, the principle *Fostering Complex Adaptive Systems* Thinking directly led to a robust discussion in the workshop on preparing for unexpected events, such as pandemics or extreme weather, culminating in ideas for an "emergency response layout" and first-aid training. Furthermore, the framework acted as a diagnostic tool that prompted participants to re-evaluate existing practices. On *Slow Variables and Feedback*, participants quickly grasped the importance of slow variables, identifying "plant growth", "soil quality", and "community trust" as foundational elements that are easily overlooked but affect the final presentation of the garden. The framework also structured complex value negotiations. For instance, it helped participants weigh the trade-offs of commercial partnerships (*Connectivity*) to reach a consensus on seeking value-aligned local collaborations (like independent bookstores) rather than large corporations, thus prioritising systemic resilience over short-term financial gain (see Table 2). These behaviours indicate a strong community readiness to engage with long-term thinking when provided with an appropriate conceptual framework. The findings also indicate a notable difference in the utility of the seven principles across the co-design process. The principles were applied more readily and effectively during the backcasting of actions than during the initial visioning phase, as participants used them to translate abstract future aspirations into specific, near-term actions.

Table 2 Translating SES principles into prompts and the resulting proposed actions co-created by participants

SES Principle	Question-based Prompts used in the workshop	Examples of Co-created Actions
Manage connectivity	How does our garden currently interact with the outside world (like local shops, schools, or other community groups)? Do these connections bring us 'nutrients' and energy, or do they end up feeling like an extra burden?	Seeking cooperation with the nearby bookstore and flower shop.
Manage slow variables and feedback	What are the invisible but crucial things quietly changing in our garden over time? Things like the actual quality of the soil, the deepening trust among neighbours, or people's growing sense of belonging here.	Use nature-focused volunteer working group to start recording flower quality and soil quality monthly; Record the participants' demographic characteristics for each garden activity.
Foster CAS thinking	How adaptable are we when faced with sudden surprises? Whether it's extreme weather, losing a core volunteer unexpectedly, or a sudden change in our rules, can our team quickly bounce back and adjust?	Rainwater collecting system to recycle and reuse rainwater, first-aid training.
Encourage learning	Has the garden become a place where everyone can learn from each other? Are skills and experiences (beyond just plant care) easily shared across the community?	Invite nature educators to record podcasts; Earn points by holding sharing sessions and then use these points to learn and participate in other sharing sessions.

Another finding from the workshop was the participants' consistent emphasis on the criticality of the action planning phase. A recurring sentiment expressed during the discussions was that a vision, if not promptly translated into practice and tangible feedback, would render the entire co-design process a "failed and energy-consuming experience" for the community. This was reflected in a strong orientation toward concrete, near-term operational concerns, such as identifying key contacts for an event or defining initiation steps over abstract, long-term concepts. This observation provides clear empirical evidence of a preference at the community level for tangible, immediately executable outputs.

In summary, the findings provide compelling preliminary evidence that the TD+SES resilience approach can effectively scaffold a community-led process of diagnosing resilience and designing sustainable futures. It enables participants to link near-term actions to a 5-year vision while keeping critical ecological dynamics and governance arrangements visible.

5. Discussion

Our findings demonstrate that integrating SES principles with TD backcasting creates a practical dialogic scaffold that makes abstract sustainable narratives tangible at the community level. The following sections interpret the significance of the findings and reflect on the role of the designer in participatory transitions, critically examine the methodological nuances of the framework, and conclude by proposing a set of transferable insights. Notably, the following discussions regarding temporal recalibration and the distinctions between community-scale and macro-level interventions serve as a direct response to the challenges of applying TD at the grassroots level, as identified in the introduction.

Our findings provide empirical evidence for the evolving role of the designer as a "bridge-builder" who navigates the dialectic between expert and diffuse design (Manzini, 2015; Campbell, 2015 & 2017; Gaziulusoy & Ryan, 2017; Baron, 2025a). The

proposed TD+SES framework serves as the specific tool through which the designer enacts this role. The practice of translation: re-contextualising abstract SES principles into accessible, question-based prompts, is a main example. This act empirically validates the arguments of scholars like Reason & Bradbury (2008) and Baron & Hoeta (2025) on the need to integrate scientific knowledge with the specificities of a local context. Our research demonstrates how this can be done in practice, showing that the designer, by providing this scaffold, does not impose expert knowledge but rather creates the conditions for an active, inquiry-based exploration by the participants themselves. Therefore, it directly connects to a dilemma in Design for Sustainability Transitions (DfST): how to navigate conflict and build consensus. The framework's structured scaffolding is critical for mitigating cognitive load and avoiding analysis paralysis. By defining clear generative boundaries, it ensures diverse voices remain aligned, streamlining the convergent action-planning phase. Also, the backcasting process establishes a highly desirable, shared 2030 vision where stakeholders' fundamental interests naturally align. This unified destination acts as a consensus catalyst. When working backwards to immediate steps, present-day disagreements are more easily navigated and compromised, culminating efficiently in collectively owned, actionable alternatives. This process provides a practical illustration of what Hyysalo et al. (2019) describe as catalysing and channeling participant action. The SES principles gave the designer a concrete set of heuristics to guide the conversation, helping to channel participants' diverse and sometimes conflicting ideas toward plausible creative outcomes. This, in turn, enhanced the quality of the *diffuse* or *lay design* (Campbell, 2017) knowledge generated. This highlights the critical issue of participant ownership. By providing a lightweight, flexible method that lowers the participation threshold and manages conflicts, this research enhances TD's democratic potential. It demonstrates how TD can be transformed from an exclusive, expert-driven planning tool into a public-facing empowering tool at community level (Baron & Hoeta, 2025). Crucially, this new resilience tool also offers a strategic response to the foundational challenge identified during our initial interviews about authentic participation. The results suggest that providing a TD backcasting process with clear SES principles can cultivate more authentic individual commitment in the garden's future. The framework empowers community garden members to transition from passive subjects of management to active architects of their own resilience. While the workshop successfully demonstrated this generative capacity, determining if this structured experience translates into sustained, proactive stewardship and self-organisation is a critical trajectory for longitudinal follow-up in our research.

Our findings highlight that community-scale transitions are different from broad-scale practices, a distinction that can be understood across key dimensions and which carries profound implications for TD's development. This can be argued with two critical methodological insights that contribute to the broader discourse on TD. The first is the framework's *phase-dependency*. Our findings clearly indicate that participants applied the seven-principle framework more readily and effectively during the backcasting action planning phase than during the initial visioning process. We attribute this to the distinct cognitive demands of each task. Visioning is a divergent and affective exercise where a highly structured framework can feel like a constraint. Conversely, action planning is a convergent and logical task that naturally benefits

from a scaffold to organise thoughts and evaluate options. This suggests that applying complex systems theory to participatory design (Baron, 2023) requires a nuanced understanding of when to impose structure and when to allow for open-ended exploration. The second insight relates to the temporal scale of transition pathways. Second, our findings offer a critical perspective on the multi-decadal timeframes (e.g., 40–80 years) conventionally employed by transition governance frameworks like Transition Management (Frantzeskaki et al., 2017). Our study found that recalibrating the timeframe to a shorter 5 year mid-range perspective was instrumental in bridging the cognitive *vision-action gap,* enabling participants to translate their aspirational futures into a coherent pathway. Large-scale transitions aim for policy-making implemented by future institutions, whereas community transitions demand immediate, hands-on practice by the participants themselves. They lack the resources to wait for a grand strategy to be enacted. This makes the *vision-action gap* more consequential, as a workshop must culminate in collectively-owned next steps to be perceived as successful. Our finding on temporal recalibration is a critical adaptation that tailors TD's process to the faster, more action-oriented rhythm of community practice, enabling quicker feedback loops. Another possible explanation could be that, unlike large-scale forums populated by organisational *representatives* accustomed to strategic language, community-level participants are *individuals* driven by personal passion, emotional connection, and lived experience. As confirmed by our workshop feedback, this makes the challenge of abstraction more acute; TD's long-term, multi-decadal perspective can feel disconnected from their immediate concerns, such as "who will initiate the action next month.This result provides empirical validation for the call by Hyysalo et al. (2019) for “intermediate codesigning” approaches that enhance actionability, and align with Anderies' (2014) theoretical assertion regarding multi-scale design structures. However, we acknowledge this adjustment is not without contention. Shortening the temporal horizon may risk sacrificing the radical, paradigm-shifting potential inherent in true long-term thinking, potentially leading to more incremental change. Therefore, while this study suggests a valuable adaptation for community-based workshops, further research is needed to validate how this temporal recalibration functions across different contexts.

Ultimately, this exploratory study aims to provide transferable design insights for future practice. Based on the discussion above, we propose the following two points:

1) Our findings (Table 2) show abstract principles only become actionable when translated into highly customised prompts. Therefore, pre-workshop immersion and informal outreach are not merely administrative preparations, but integral design interventions (Light & Akama, 2012). Designers must invest in understanding the community's unique values to craft tailored prompts that diagnose specific local issues (Baron & Hoeta, 2025). Only through such tailored designs can we level the epistemic playing field for non-expert stakeholders.
2) 2) The findings empirically highlighted the vision-action gap inherent in community transitions. Unlike macro-level interventions seeking policy guidelines, community-scale practice demands immediate, tangible action; prolonged focus on abstract, multi-decadal futures without near-term execution was perceived as exhausting.

Furthermore, our observation of *phase-dependency* revealed that highly structured analytical frameworks (like the SES principles), while crucial for convergent action planning, may constrain the divergent thinking necessary for early-stage visioning. Researchers must act as temporal connectors by adopting a phased approach to tool application. Practitioners should avoid the uniform application of a single framework throughout a workshop. Instead, the introduction of analytical tools should be carefully timed to match the specific cognitive demands of the community and the phase of the co-design process. Rather than mimicking our specific sequence (narrative visioning followed by structured planning), practitioners should localise the principle of *phase-dependency*. This requires dynamically shifting between open stimuli for imaginative generation and rigid analytical criteria.

6. Conclusion and Next Steps

The primary contribution of this research is a novel methodological framework that creatively integrates TD and SES resilience. Rather than merely combining the two, we use the seven SES principles to structure and ground the backcasting transition pathway design process. This dual-purpose approach addresses TD's potential abstractness in practice while providing a concrete design application for the analytical SES framework, positioning design as a method for exploring, prototyping, and testing new ways of organising complex socio-ecological relationships.

The study's findings, however, are preliminary and limited to a single case study in Shanghai, with a small sample. The framework's cross-cultural applicability in different contexts remains to be verified. These limitations are directly informing our future research. The next immediate step of this research project is a comparative case study in Auckland, New Zealand, to validate and refine the framework, contributing to a more nuanced understanding of how such design processes can be adapted to diverse socio-cultural settings, and ultimately building a transferable set of strategies for community-led sustainable transitions.

7. References

Anderies, J. M. (2014). Embedding built environments in social–ecological systems: resilience-based design principles. *Building Research & Information, 42*(2), 130–142. https://doi.org/10.1080/09613218.2013.857455

Baron, G. N. (2025). *Design for Environmental Conservation: A Toolkit that Enables Sustainable, Participatory and Distributed Innovation*. Springer Nature. https://dx.doi.org/10.1007/978-981-96-9574-4

Baron, G.N. (2025a). Holding Space for Participatory Innovation. In: Baron, G.N. (eds) *Design for Environmental Conservation*. Springer, Singapore. https://doi.org/10.1007/978-981-96-9574-4_3

Baron, G.N. & Hoeta, A. (2025). The Need for Distributed, Decentralized, and Decolonial Environmental Conservation. In: Baron, G.N. (eds) *Design for Environmental Conservation*. Springer, Singapore. https://doi.org/10.1007/978-981-96-9574-4_2

Baron, G. N. (2023). Design for conservation: A toolkit that enables sustainable, collaborative, and distributed innovation. In *Proceedings of Cumulus Detroit Conference – Design for Adaptation* (pp. 749–764). Detroit, USA. ISBN 979-8-218-07901-7

Barón, G., & Ghelich Khani, N. (2021). Defining design for sustainability and conservation mindsets. *Cuadernos del Centro de Estudios de Diseño y Comunicación*, (132), pp 45–52. https://doi.org/10.18682/cdc.vi132.4983

Biggs, R., Schlüter, M., Biggs, D., Bohensky, E. L., BurnSilver, S., Cundill, G., ... & West, P. C. (2012). Toward principles for enhancing the resilience of ecosystem services. *Annual review of environment and resources, 37*(1), 421-448. https://doi.org/10.1146/annurev-environ-051211-123836

Buchanan, R. (2010). Wicked problems in design thinking. *Kepes, 7*(6), 7–35.

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative research journal, 9*(2), 27-40.

Berkes, F., Colding, J., & Folke, C. (Eds.). (2008). *Navigating social-ecological systems: Building resilience for complexity and change.* Cambridge University Press.

Campbell, A. D. (2026). Urban artisanal food design for regeneration and resilience in Johannesburg, South Africa. In D. Daou & M. Sarantou (Eds), *The Transformative Nature of Food* (pp. 200–213). Routledge. https://doi.org/10.4324/9781003646655-18

Campbell, A. D. (2021). *Designing Development: An Exploration of Technology Innovation by Small-Scale Urban Farmers in Johannesburg* [PhD Thesis, University of Johannesburg]. http://hdl.handle.net/10210/477611

Campbell, A. D. (2017). Lay Designers: Grassroots Innovation for Appropriate Change. *Design Issues*, *33*(1). https://doi.org/10.1162/DESI_a_00424

Campbell, A. D., & Harrison, P. H. (2015). A Framework for Socio-Technical Innovation: The Case of a Human-Powered Shredder. In L. Collina, L. Galluzzo, & A. Meroni (Eds), *Proceedings of the Cumulus Conference, Milano 2015: The Virtuous Circle: Design Culture and Experimentation* (pp. 211–230). McGraw Hill Education.

Campbell, A. D., & Rapitsenyane, Y. (2023). Advancing Afrikan Sustainable Design. In R. Maolosi & Y. Rapitsenyane (Eds), *African Industrial Design Practice* (pp. 26–45). Routledge. https://doi.org/10.4324/9781003270249-4

Coops, F., Lockton, D., Gaziulusoy, İ., Tonkinwise, C., Boehnert, J., Ortega Pallanez, M., Overdiek, A., Nilstad Pettersen, I., Culén, A. L., & Juri, S. (2024, June 23). *Designing (for) transitions and transformations: Imagination, climate futures, and everyday lives.* DRS2024: Boston. https://doi.org/10.21606/drs.2024.167

Ceschin, F., & Gaziulusoy, İ. (2019). *Design for sustainability: a multi-level framework from products to socio-technical systems.* Routledge https://doi.org/10.4324/9780429456510

Chen, J., Ji, D., Wang, Z., & Liu, Y. (2023). 中德社区花园生态系统服务评价比较研究: 以上海杨浦区和德国埃森市为实证[Comparative study on ecosystem services evaluation of community gardens in China and Germany: Case studies on Essen and Yangpu]. *华中建筑*[*Huazhong Architecture], 2*, 130-135.

Frantzeskaki, N., Broto, V. C., Coenen, L., & Loorbach, D. (Eds.). (2017). *Urban sustainability transitions (Vol. 5).* New York: Routledge. doi.org/10.4324/9781315228389

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global environmental change, 16*(3), 253-267. https://doi.org/10.1016/j.gloenvcha.2006.04.002

Gaziulusoy, A. İ., & Erdoğan Öztekin, E. (2018, June 25). *Design as a Catalyst for Sustainability Transitions.* DRS2018: Design as a catalyst for change. https://doi.org/10.21606/drs.2018.292

Gaziulusoy, A. İ., & Ryan, C. (2017). Roles of design in sustainability transitions projects: A case study of Visions and Pathways 2040 project from Australia. *Journal of Cleaner Production, 162*, 1297–1307. https://doi.org/10.1016/j.jclepro.2017.06.122

Guitart, D., Pickering, C., & Byrne, J. (2012). Past results and future directions in urban community gardens research. *Urban Forestry & Urban Greening, 11*(4), 364–373. https://doi.org/10.1016/j.ufug.2012.06.007

Holling, C. S. (1973). *Resilience and stability of ecological systems.* http://www.jstor.org/stable/2096802?origin=JSTOR-pdf

Holling, C. S., & Gunderson, L. H. (Eds.). (2002). *Panarchy: understanding transformations in human and natural systems.* Island press. https://doi.org/10.1016/S0006-3207(03)00041-7

Hyysalo, S., Marttila, T., Perikangas, S., & Auvinen, K. (2019). Codesign for transitions governance: A mid-range pathway creation toolset for accelerating sociotechnical change. *Design Studies, 63*, 181–203. https://doi.org/10.1016/j.destud.2019.05.002

Hyysalo, S., Perikangas, S., Marttila, T., & Auvinen, K. (2019). Intermediate Codesigning in Transitions Governance: Catalysing and Channelling Participant Action. *The Design Journal, 22*(6), 873–894. https://doi.org/10.1080/14606925.2019.1661557

Irwin, T. (2015). Transition Design: A Proposal for a New Area of Design Practice, Study, and Research. *Design and Culture, 7*(2), 229–246. https://doi.org/10.1080/17547075.2015.1051829

Irwin, T. (2020). The emerging transition design approach. *Cuadernos del Centro de Estudios en Diseño y Comunicación. Ensayos,* (87), 19-46. https://doi.org/10.18682/cdc.vi73.1043

Irwin, T., Tonkinwise, C., & Kossoff, G. (2020). Transition Design: An Educational Framework for Advancing the Study and Design of Sustainable Transitions. *Cuadernos Del Centro de Estudios de Diseño y Comunicación, 105*. https://doi.org/10.18682/cdc.vi105.4188

Kossoff, G., Irwin, T., Sadri, H., & Zeybekoglu, S. (2022). Transition design as a strategy for addressing urban wicked problems. In *Cities Without Capitalism* (1st ed., pp. 90–120). Routledge. https://doi.org/10.4324/9780429352485-6

Kossoff, G. (2024). Embracing an ecological worldview and cosmopolitan localism for sustainable transitions toward more equitable futures. *Cuadernos del Centro de Estudios en Diseño y Comunicación. Ensayos,* (222), 27-37. https://doi.org/10.18682/cdc.vi222.11201

Kishita, Y., Höjer, M., & Quist, J. (2024). Consolidating backcasting: A design framework towards a users' guide. *Technological Forecasting and Social Change, 202*, Article 123285. https://doi.org/10.1016/j.techfore.2024.123285

Light, A., & Akama, Y. (2012, August). The human touch: participatory practice and the role of facilitation in designing with communities. In *Proceedings of the 12th Participatory Design Conference: Research Papers-Volume 1* (pp. 61-70).

Lähteenoja, S., Marttila, T., Gaziulusoy, İ., & Hyysalo, S. (2023). Transition co-design dynamics in high level policy processes. *Design Studies, 88*, 101207. https://doi.org/10.1016/j.destud.2023.101207

Lockton, D., & Candy, S. (2018, June 25). *A Vocabulary for Visions in Designing for Transitions.* DRS2018: Design as a catalyst for change.

https://doi.org/10.21606/drs.2018.558

Loorbach, D., & Rotmans, J. (2010). The practice of transition management: Examples and lessons from four distinct cases. *Futures, 42*(3), 237–246. https://doi.org/10.1016/j.futures.2009.11.009

Liu, Y., Fan, H., Wei, M., Yin, K., & Yan, J. (2017). 从可食景观到活力社区: 四叶草堂上海社区花园系列实践 [From edible landscape to vital communities: Clover Nature School community gardens in Shanghai]. *景观设计学[Landscape Architecture Frontiers], 5*(3), 72-83.

Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*. Sage publications.

Quigley, M., Blair, N., & Davison, K. (2018). Articulating a social-ecological resilience agenda for urban design. *Journal of Urban Design, 23*(4), 581–602. https://doi.org/10.1080/13574809.2018.1440176

Rocha, C. S., Antunes, P., & Partidário, P. (2019). Design for sustainability models: A multiperspective review. *Journal of Cleaner Production, 234*, 1428-1445. 10.1016/j.jclepro.2019.06.108

Stockholm Resilience Center (SRC). (2015). *Applying resilience thinking: Seven principles for building resilience in social-ecological systems.* Stockholm: Stockholm Resilience Centre. https://www.stockholmresilience.org/download/18.10119fc11455d3c557d6928/1459560241272/SRC+Applying+Resilience+final.pdf

Tonkinwise, C. (2015). Design for Transitions – from and to what? *Design Philosophy Papers, 13*(1), 85–92. https://doi.org/10.1080/14487136.2015.1085686

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, Adaptability and Transformability in Social–ecological Systems. *Ecology and Society, 9*(2), 5. https://www.jstor.org/stable/26268226

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