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ORIGINAL ARTICLE

A People-Focused Systems Approach to Sustainability

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Highlights

- The current study offers a people-focused systems approach to promoting environmental sustainability in organizations.
- We describe a case study of a sustainable social system and its 11-year trajectory at a bicultural high school.
- The current study uses complex systems thinking and methodology to map the sustainable social system.
- Findings suggest a democratic process for change designed to empower and connect sustainability advocates.

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Abstract Creating organizations that promote human and ecological flourishing (i.e., sustainability) is a key challenge for contemporary societies. Here, we offer a people-focused systems approach to organizational sustainability based on an action research project conducted at Western Springs College/Ngā Puna O Waiōrea, a bicultural high school in Aotearoa New Zealand. The project ran from 2008 to 2018 and drew on the values and skills of community psychology and environmental education to build what we call a "sustainable social system" (SSS). In 2018/19, we conducted interviews with 23 key people involved in sustainability efforts at the school and analyzed the minutes of 46 meetings of the school's Sustainability Panel. We used a complex systems approach to produce a map of the core people, purpose, infrastructure, and activities components and sub-systems in the SSS, as well as its emergent properties of a sustainability culture and identities. We describe the historical trajectory of the SSS and discuss seven features that we consider of particular significance in contributing to its growth and resilience. We then offer steps toward a people-focused SSS led by insiders with sustainability values. These include establishing a democratic and inclusive sustainability network, and attempting to integrate sustainability with the organization's essential activities.

Keywords Sustainability · Complex systems · Organizations · Schools · Case study · People-focused systems

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Introduction

As recognized by the United Nations' Sustainable Development Goals, contemporary societies face numerous interlinked challenges related to people and the natural environment, including poverty, climate change, inequality, and polluted air and water (Griggs et al., 2013; Nilsson, Griggs, & Visbeck, 2016). In essence, these challenges concern how to manage ourselves "sustainably," that is in a manner that promotes human and ecological flourishing both in the present and for the future (Riemer & Harré, 2017). It is increasingly clear that human activity is causing profound damage to many of the natural ecosystems on which we, as people, depend (Díaz et al., 2019; IPCC, 2018). Therefore, a key focus for sustainability oriented work is transforming how we live and act in order to protect and regenerate the natural environment.

This article describes an 11-year partnership between ourselves as community psychologists and Western Springs College/Ngā Puna O Waiōrea (WSCW) a public, co-educational high school in Aotearoa New Zealand that has gone some way toward achieving such a transformation. Based on our findings, we propose a novel "people-focused systems approach" that combines complex systems thinking with the values and expertise of community psychology and environmental education, to promote sustainability at an organizational level. First, we provide a brief rationale for our focus on real people in complex systems and then outline the principles we drew on to promote, describe, and understand the "sustainable social system" at WSCW. We follow this with the research questions, methodology and

findings specific to our case study and conclude with suggestions for those wanting to foster sustainability within a contemporary organization. Overall, we hope this article provides readers with a new framework for working within, or alongside, organizations to bring about sustainability-related changes and embed a sustainability culture.

Beyond Variables: Why Change Involves Real People in Complex Systems

The sustainability challenge is *complex*, it exists at all social levels and in the interactions between and within those levels (Capra & Luisi, 2014). Psychology has made a major contribution toward understanding environmentally relevant individual behavior and cognition (e.g., Gifford, 2011; Nielsen et al., 2020; Osbaldiston & Schott, 2011). There has also been considerable research on sustainable organizations, our focus here (e.g., Bertels et al., 2010; Landrum & Ohsowski, 2018; Ones & Dilchert, 2012; Stephan, Patterson, Kelly, & Mair, 2016; Stern et al., 2016). Research from these fields has resulted in a plethora of variables that are offered as "effective treatments" (Osbaldiston & Schott, 2011, p. 285), "evidence based practices" (Ones & Dilchert, 2012, p. 512), or "change mechanisms" (Stephan et al., 2016, p. 1262). Context is recognized in this work; however, it is often treated as another variable that will eventually be specified, allowing a "theory of what generalizes and what does not" (Nielsen et al., 2020, p. 9) or the "scaling up and out" of sustainability solutions (Romero-Canyas & Hiltner, 2020, p. 169).

This drive to name, test, and generalize the variables that promote sustainable practice and has at least two key limitations when it comes to facilitating sustainability-oriented change in real world communities. First, it assumes that once we understand all the variables at play, it will be possible to match the right interventions to a target group and the expected improvements will follow; a process described by Michael Quinn Patton as "socializ[ing us] to make meaning of what we see by reducing complex dynamic systems to linear logical models" (Patton, 2019, p. 106). Second, it invokes a free-floating change agent who steers a group of people toward the "right" practices as identified by experts. This, to us at least, is antithetical to the democratic, inclusive processes that are an inherent part of human flourishing and thus "sustainability" and "sustainable" social systems as we discussed earlier (see Harré, 2018b; Wals, 2010).

So while there is value in teasing out the variables that contribute to sustainable practice, it is also crucial to recognize that actual, rather than theoretical, change is managed by real people in local settings. Understanding and facilitating such change is assisted, we suggest, by a systems thinking approach that involves working alongside community members, the latter being a core value and expertise offered by community psychology (Riemer, Reich, Evans, Nelson, & Prilleltensky, 2020). This article, and the case study it describes, takes such an approach.

A Complex Systems Approach to Sustainability

Complex systems thinking (or "systems thinking") has been applied to both physical and social systems, as well as the interaction between the two (see Capra & Luisi, 2014). Here, we draw primarily, but not exclusively, on concepts used to describe social systems, and a "soft systems" approach. A soft systems approach assumes sustainability is a "messy" problem (Chapman, 2004; Checkland & Scholes, 1990). As articulated by Chapman (2004) such problems, "...are unbounded in scope, time and resources, and enjoy no clear agreement about what a solution would even look like, let alone how it could be achieved" (p. 19). Given this, it is not possible to "achieve sustainability" in a particular community by simply analyzing the causes of "unsustainable" practices and implementing "best practice" solutions, as is often implied by the variable-focused research discussed earlier. Instead, community members are inherent to all levels of the process, including identifying any sustainability-related improvements.

In retrospect, and as we do in this article, it may be possible to argue that a sustainability transformation has occurred, and trace the process of change by identifying key shifts and their likely triggers. But every new project involves risk, with each step being one that may or may not take the system forward in the way intended (see Capra & Luisi, 2014; Flood, 2006; Foster-Fishman & Watson, 2017; Stacey, 1996). So systems thinking does not offer linear cause-and-effect rules for social change (if "this" is the situation, then do "that"). It does however, offer language by which to understand a social system, such as, our focus here, an organization. This language can help researchers and practitioners understand the system concerned, provoke and monitor change, and facilitate the exchange of ideas across social settings, all of which we aim to do here. We outline the key systems concepts used in our project now. We illustrate these in reference to a school, but they are intended to apply to organizations more broadly.

Key Concepts for Understanding an Organization as a Social System

Social systems can be thought of as having *components*, a *pattern* which is the configuration between various components, and a characteristic *process* which is the dynamics and flow of the system (Capra & Luisi, 2014). One feature of social systems is that they have a *purpose*, that is the actors within the system are attempting to act consistently with what is valued (Flood, 2006; Vickers, 1965/1995). The purpose of a social system contributes to its *attractor*

(or *form*), which is the focus around which it adheres into a particular pattern and process (Capra & Luisi, 2014; Checkland & Scholes, 1990; Clayton & Radcliffe, 1996; Stacey, 1996). For example, the broad purpose of a typical school is to "educate students," and its daily routine, annual cycle, and the expectations of community members reflect this as the system continually re-forms itself into a well-established pattern. However, "educating students" is not all a school does, and not all community members hold and act consistently with this purpose. Hence, it may be useful to identify multiple purposes within a system, particularly when promoting change.

While purposes are crucial to the form of social systems, the system as a whole arises from the interaction of all its *components* (Checkland, 1999; Checkland & Scholes, 1990; Flood, 2006; Willamo et al., 2018) and thus has *emergent properties*. Individual schools, for example, have a *culture* that is emergent in this sense. A culture, as we use it here, is the beliefs, practices, use of artifacts, and exchanges between people that help make a social system feel bounded and purposeful. Members also have *identities* associated with the culture that help them feel they belong. Cultural change cannot be imposed or deliberately engineered, but it does signify a substantial, and potentially long-term, shift in the system as a whole (see Capra & Luisi, 2014; Foster-Fishman, Nowell, & Yang, 2007).

An important feature of all living systems is that they are *non-linear* (Capra & Luisi, 2014; Chapman, 2004; Mason, 2008; Rickles, Hawe, & Shiell, 2007). This means that the form the system takes is not due to the apparent size of the various components alone, but also to how the system responds to those components. *Feedback loops* can amplify or reduce the impact of a component. In social systems people's reactions to new components (i.e., *inputs*) are particularly critical to the direction of feedback loops (Stacey, 1996). For example, a school may have a new principal, which is theoretically a large input, given the potential power of the role. However, the principal's influence will depend on a number of factors, such as their fit with the existing school culture, the support they have from the governing board, and, if they want to make change, whether there are teachers who want similar change. Relatively small inputs too, like a student initiative, may be amplified if the system is open to change in the direction of the initiative. Because of the way in which influence ricochets around different components and levels of the formal hierarchy, social systems may be more usefully considered "networked" rather than hierarchically "nested," the latter being central to Bronfenbrenner's ecological systems theory (see Neal & Neal, 2013).

Communication, that is the exchanges between people and between people and other system components, is crucial to how a social system functions (Capra & Luisi, 2014; Checkland, 1999; Checkland & Scholes, 1990; Clayton & Radcliffe, 1996; Mason, 2008). Exchanges may be linguistic, artistic, behavioral, emotional, or combinations of these. In most social systems, and certainly in schools, some roles (e.g., the role of principal) provide more access to communication channels than others. However, in keeping with the principle of non-linearity, communications are subject to feedback loops as they pass through, or do not pass through, the system's social network. For example, a principal's plea for students to come to class on time, may or may not be listened to, passed on and taken up by the student body, which will in turn influence the principal's next move. Within a social network, there are *clusters* of people with *strong ties* who readily pass information of interest between them (Christakis & Fowler, 2013), and who tend to trust each other and have ways of resolving conflicts (Henry & Vollan, 2014). *Bridging* components (Foth, 2006; Henry & Vollan, 2014; Lawlor & Neal, 2016; Todd, 2012) are sites at which representatives from various clusters come together to exchange information and potentially build trust. Communication also occurs between one social system and neighboring systems, so in this sense social systems are *ambiguously bounded* (Davis & Sumara, 2006).

Systems move through time and thus have *trajectories* (Rickles et al., 2007). In some circumstances, the components, pattern, and process of a system may change so radically that it appears to have a new attractor (i.e., form). For those of us interested in creating sustainable organizations, a critical question is how we can encourage a form more aligned with a sustainability purpose and its associated practices.

How Social Systems Change

How systems change and why they remain stable over time are two sides of the same coin. *Stability* is the tendency of systems to repeat the patterns of the past, unless they are subject to significant new inputs (see Stacey, 1996). Stability is related to *resilience*, a system's ability to remain stable despite weaknesses or threats (see Davidson, 2010; Hawe, 2017; Wilson, 2014). Importantly, it takes a lot of time and energy, primarily expended by people, to maintain a social system. This time and energy may be *locked in* (Mason, 2008; Westley, Zimmerman, & Patton, 2007; Wilson, 2014), giving people little capacity to act in ways that are outside the requirements for system maintenance. Incoming people bring to the system *identities* formed from their previous choices and experiences. In a highly stable system, these inputs do not affect how it operates. In a system that is more open to change, however, new members whose identities suggest different

approaches to organizational life are *noticed*. A system that is open to change is also able to *release* the energy of members enabling them to do new tasks.

A *phase transition* is when a system changes into something new (Mason, 2008). In physical systems, this may be apparent to any human observer, such as when water changes to ice. In social systems a phase transition involves a change to "deep structures" (Foster-Fishman & Watson, 2017, p. 255) such as policies, resources, and interactions between system components. Sometimes, this change is readily apparent, such as after a revolution or natural disaster (Chenoweth & Stephan, 2011), but often it is not. One difficulty in determining if a system has changed is that the very existence of a particular social system is, to some extent, subjective. That is, the components of a system and its pattern and so on are not matters beyond refute but are ways people try to make sense of what they consider to be a system (see Chapman, 2004; Shiell & Riley, 2017). Furthermore, when attempting to solve a messy problem like creating a sustainable organization, we are not looking for a phase transition that shows up as a shift away from the organizations' central purpose and form, as in the case of a school "to educate students," but instead shows up as an additional purpose that helps shape the current form.

A People-Focused Systems Approach

As well as drawing on the language and concepts of complex systems just described, our approach drew on core principles from community psychology and environmental education. In relation to community psychology, we focused on empowerment and working to the strengths of the organization (see Blythe et al., 2013 for a detailed outline of our use of these principles, developed in the early stages of the partnership). In brief, we attempted to facilitate the personal and relational empowerment of those involved (Christens, 2012; Perkins & Zimmerman, 1995) by creating a supportive network of sustainability advocates, careful listening, being readily available and responsive, and working together to negotiate the bureaucracy and politics of the organization and other agencies (see also Riemer, Lynes, & Hickman, 2014).

Environmental education has a long history of advocating whole school approaches that involve action *for* the environment including realigning a school's practices to help regenerate and preserve the natural world (see Eames, Cowie, & Bolstad, 2008; Henderson & Tilbury, 2004; Mogren, Gericke, & Scherp, 2019). It includes concepts such as "action competence" (Jensen & Schnack, 1997) and an "emancipatory" approach (Wals & Dillon, 2013; Wals, Geerling-Eijff, Hubeek, van der Kroon, & Vader, 2008), these being iterative processes involving practice and reflection, "...in which people learn *from* and *with* one another and collectively become more capable of withstanding setbacks and dealing with insecurity, complexity, and risks" (Wals & Dillon, 2013, p. 259, emphasis in the original). While the current project took place in a community with an explicit learning focus (a school), this learning cycle is equally relevant to sustainability transitions in other organizational and community settings (see Sol, van der Wal, Beers, & Wals, 2018) and is consistent with several general theories of learning for change (e.g., Chapman, 2004; Freire, 1970/1996; Kolb, 1984; Schon, 1983). Over the course of the project, and particularly due to working with the school's "Enviroschools" facilitator (see www.enviroschools.org.nz) and teachers, this patient, learning-oriented focus became part of our core practice.

In summary, our people-focused systems approach aimed to bring together people with sustainability-oriented values and provide an environment that encouraged creative, collective initiatives to promote sustainability within the organization. In keeping with the messiness of sustainability, we did not focus on specific long-term goals so much as on keeping sustainability-oriented organizational members engaged, observant, and connected; always seeking opportunities to notice and increase the visibility of their efforts. We hoped this would create and strengthen sustainability-oriented identities and network clusters in the organization, allow sustainability-related communication to flow readily, facilitate positive feedback loops that accentuated change, and ultimately result in a phase transition in which a "sustainability culture" emerged. It was only within this overall approach that specific objectives and actions arose. Importantly, we considered that our open, responsive process held by a loosely defined purpose would not only help create what we call here a sustainable social system (SSS), but in itself prefigured that system. This is consistent with our earlier argument that democratic, inclusive processes are an inherent part of sustainability as we have defined it.

As we will outline next, our research process was entwined with our people-focused systems approach to change. It aimed to map the SSS at the school, understand the trajectory by which the system developed, and identify likely triggers of change.

The Case Study

The case study took place at Western Springs College/Ngā Puna O Waiōrea (WSCW). WSCW is structured as two schools in partnership, with Western Springs College, the larger English-medium school being taught in English, and Ngā Puna O Waiōrea being taught in *te reo* Māori (the Māori language) and informed by *te ao* (the world) and *tikanga* (customs or practices) Māori. Ngā Puna O

Waiōrea is commonly referred to as the "Rumaki" which means "immersion." Each school has a principal, with a single Co-governance Board. The Rumaki has its own classrooms, kitchen, *marae* (meeting space), and *whare tapere* (performance space), but the students come together for many events and share much of the physical infrastructure (e.g., outdoor areas, the gym, library, technology rooms). WSCW is located in central Auckland, a city of 1.6 million people in Aotearoa New Zealand.

The Initiation and Goals of the Sustainability Project

In 2007, the first author had a daughter at WSCW and was on the school's Governance Board (this officially became the Co-governance Board in 2019). She suggested the school adopt a strategic goal to, "…work towards environmental sustainability in all areas of school life." The board agreed and the following year appointed the first author as the coordinator of a new Sustainability Panel that would oversee the goal. With the agreement of the board, the first author set up an action research project to help forward, and monitor progress toward, the strategic goal. Over the 11-year duration of the research project, 13 graduate students in psychology were involved and were members of the panel. These included the second author who lived locally and was involved for the first seven years, and the other two authors who were involved in 2018/19. From the beginning, the Sustainability Panel also included the school's sustainability-related student leaders, staff with responsibilities for sustainability, a representative of the Governance/Co-governance Board, and various external advisors including the facilitator from Enviroschools mentioned previously. The panel meets four times a year, grew over time, and acts as a bridging component that brings together people from different locations in the school.

The data collection and analysis of the project as a whole was informed by a combination of ethnography (see Case, Todd, & Kral, 2014), action research (see Burns, 2007; Kemmis, McTaggart, & Nixon, 2014), and case study (see Yin, 2018; Zeldin, Gauley, Barringer, & Chapa, 2018) approaches. As is emphasized by the latter two, we drew on a wide range of methods over time including whole school surveys (Long, Harré, & Atkinson, 2014, 2015), observations, field experiments (Townrow, Laurence, Blythe, Long, & Harré, 2016), and documentation of meetings and events. All research measures were discussed at Sustainability Panel meetings and had input from school students and staff. Similarly, as researchers, we considered ourselves part of the change process, not separate from it. Flexibility and reflection were key. The goal of forwarding sustainability at the school through a people-focused approach and the assumption we were working in a complex social system in which there would be unexpected promising events that could be nurtured (or, if we were not careful, neglected), took precedence over "evaluating" the outcome of formal inputs. Note: in keeping with the collaborative nature of this work, further references to "we" may refer to the Sustainability Panel as a whole, the researchers from all 11 years, or the authors of this article. We (the authors) have endeavored to ensure this is clear from the context of each usage.

Research Aims of the Case Study

The specific research aims of the case study were to (a) map the sustainable social system (SSS) within WSCW, (b) identify the trajectory by which this system developed, (c) describe the relationships and emergent properties that form and maintain the SSS, and (d) identify and describe what we consider the key features that promoted change and system resilience. In keeping with soft systems methodology (Chapman, 2004; Checkland & Scholes, 1990; Flood, 2006; Willamo et al., 2018) and what Hawe, Shiell, and Riley (2009, p. 270) refer to as a "dynamic ecological-systems perspective," we accept that what we describe here is only a version of the system we are attempting to understand. Specifically, it is enriched and limited both by our perspectives as researchers who actively participated in creating the SSS; and by conducting interviews with people at the school who currently were, or had been, involved in its sustainability journey. We start from the assumption that the project "worked" and that it is worth investigating why. It is, in this sense, an "exemplary" case (Zeldin et al., 2018, p. 323) of a sustainable social system, it is not an evaluation of the degree to which the school is "sustainable" according to objective measures. To our knowledge, the combination of methods used here is novel and was designed to best capture the people-focused systems approach underpinning the SSS at WSCW.

Method

To achieve these aims, we used two sets of data. One was interviews that took place in 2018 and 2019 with 23 key people involved in sustainability efforts at the school; the second was the Sustainability Panel meeting minutes from 2008 to 2018. While these data sets contributed to all research aims (RA), the interviews were primarily used to map the SSS as of 2018/19 (RAa) and the meeting minutes to understand its historical trajectory (RAb). Both data sets contributed equally to RAc (describing relationships and emergent properties) and RAd (key features promoting change and resilience).

Interviews with Key Participants

We used purposeful sampling to ensure the participant group could speak to different aspects of sustainability at WSCW, as well as to the process of change. Participants were identified in discussion with the principal of Western Springs College or at meetings of the Sustainability Panel. Ten of the participants were current student leaders from the school's sustainability teams (the teams will be described later and are shown on Figure 1). They were 16–18 years old, seven identified as female, three as male. Two were from the Rumaki (Ngā Puna O Waiōrea), and the other eight were from Western Springs College, the English-medium school. Note that in 2019 the Rumaki had 280 students out of a roll of 1689 for the two schools combined. Two further participants were former (female) students who had played a significant role in sustainability. We also interviewed the current principal of Western Springs College, the current Co-governance Board representative on the Sustainability Panel, a former board representative, a former Senior Manager Sustainability, the Enviroschools facilitator who had been on the Sustainability Panel from the beginning, a groundsman, and five current teachers with sustainability responsibilities (one from the Rumaki). All participants received an information sheet and signed consent to participate. The University of Auckland Human Participants' Ethics Committee approved the project.

The third or fourth author or both conducted and transcribed the interviews. Participants had an opportunity to read and revise their interview transcripts. As the student leaders work in teams, we interviewed them in small groups (six pairs and one group of four), based on their leadership portfolios. We also felt this would be the most fun for the students and encourage them to build upon each other, producing better quality data. The adults all had different histories and roles within the project so were interviewed individually. For participants currently at the school the interview referred to the present, for those who were no longer at the school, it referred to their time there. For simplicity we describe the version used for current members of the school. First, we asked participants to describe their role in the school and gender. They were then given a table, constructed by the researchers and piloted at a Sustainability Panel meeting, headed "What

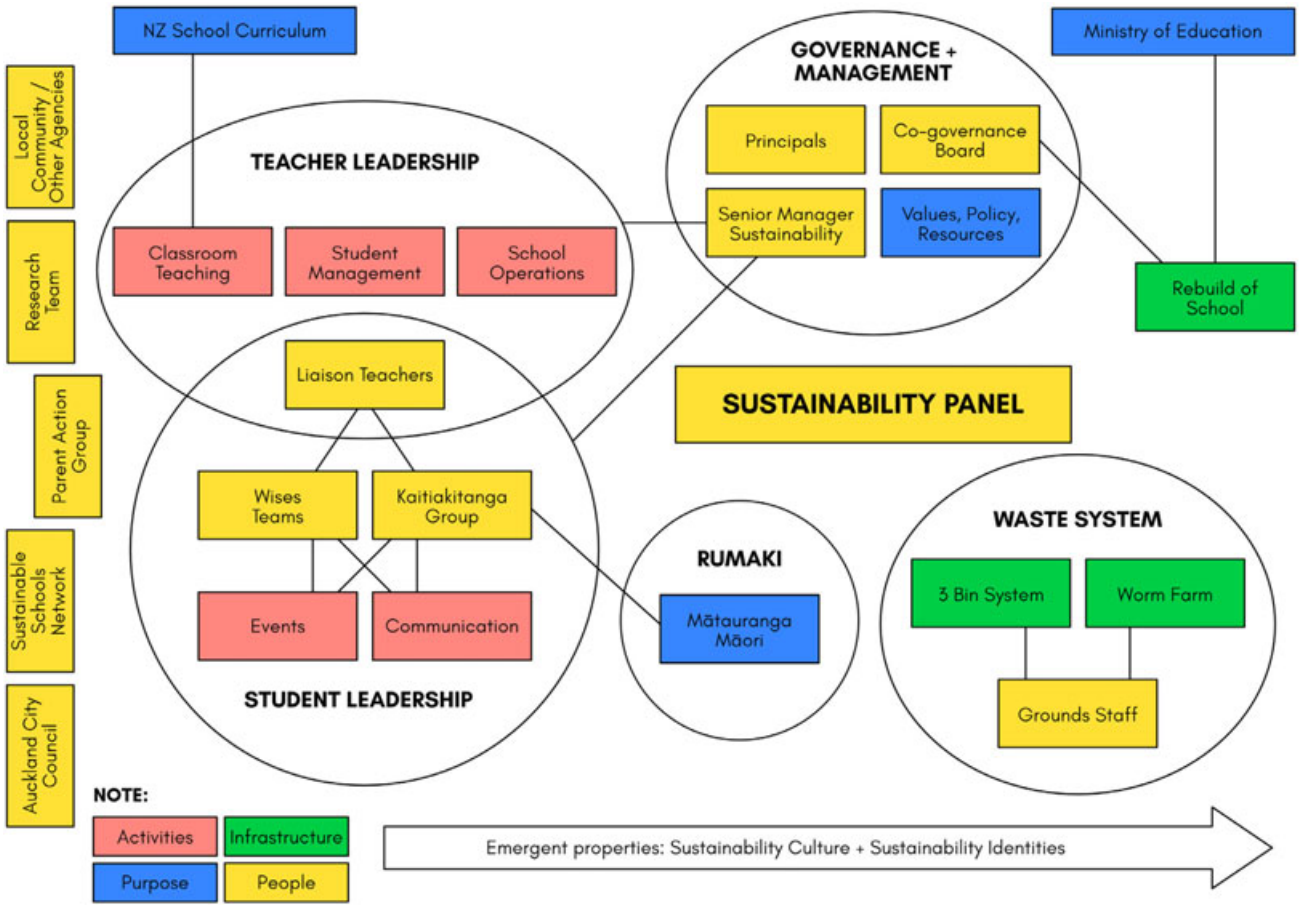

Figure 1 Map of the sustainable social system at WSCW [Color figure can be viewed at wileyonlinelibrary.com]

makes WSCW a sustainable school?" with columns designed to stimulate their thinking. These were headed as follows: People: Students, teachers, other staff, other adult supporters; Policies: rules or teaching curriculum; Culture: The way people talk to each other or the way "we do things around here"; Events: things that happened or regularly happen; Things: Physical structures at the school that help make it sustainable; Anything else. We asked them to write any examples under each column, and "draw lines between them if you think they influence each other"; the students interviewed in pairs did this exercise together, those in a group of four were spilt into pairs to allow each student easy access to the table. Next, we asked participants to talk to their table. Note that five adult participants were interviewed online, so they were simply asked to talk to the column headers and perceived relationships between them.

We then asked participants to comment on the three things they considered most important for making the school sustainable, the influence of the bicultural nature of the school, barriers to sustainability, what they thought others could learn from their school and if and how the school had made them a person who cares about sustainability. For the group interviews, the interviewer asked these questions to the group as a whole and facilitated the discussion to ensure each student had an opportunity to respond.

Authors three and four then did multiple readings of the interview transcripts and completed tables, and each independently constructed conceptual maps of the SSS as suggested by each interview (a process informed by the conceptual mapping discussed in Andrews, 2017; Checkland & Scholes, 1990). These authors and the first author then reviewed these maps at a series of meetings to identify the core system components, linkages, and emergent properties revealed and to see if there were any substantial differences or contradictions between participants or groups of participants (e.g., students when compared with teachers). This process revealed that while participants had different viewpoints in regard to the system and so emphasized some aspects rather than others, these did not contradict each other. There was also a very high degree of convergence between the maps produced by the two authors for each interview.

This analysis gave us reasonable grounds to produce a whole school SSS map that would incorporate the aspects revealed by different viewpoints. We then used NVivo 12 to assist with a second analysis of the transcripts and tables. Author one sorted the data into nodes that best captured the major system components, linkages, and emergent properties; labeling and reorganizing these in an iterative process to try and best represent the SSS as a whole. This included identifying sub-systems within the SSS that were comprised of highly related components. She also extracted information that revealed what participants saw as key inputs to the system's trajectory that boosted sustainability as well as evidence of communication and feedback loops between sub-systems/components (this information supplemented the analysis of the Sustainability Panel minutes, discussed next). The final map of the SSS as of 2018/19 shown in Figure 1 was developed over several months in tandem with the analysis of the Sustainability Panel meeting minutes. The process included the authors presenting preliminary versions of the map at Sustainability Panel meetings for discussion, a meeting with the principals of WSCW, and numerous discussions and email exchanges between the authors. The major sub-systems and components shown on the map are described in more detail on Table 1.

Analysis of the Sustainability Panel Meeting Minutes

The second set of data was the minutes of the Sustainability Panel from 2007 to the end of 2018. This analysis was conducted by the first two authors. It is notable that the first author had attended almost all of the 46 meetings involved and had written the minutes until the end of 2017, the second author had also attended most of the meetings until the end of 2014. We were then, reading the minutes as "insiders," we knew who was who and had developed a sense of "what was going on" in our years of involvement and reflection with each other and others on the Sustainability Panel.

First, the second author collated and summarized information from the minutes under the following headings that appeared to best represent the content covered: major policy changes; prizes, grants and awards; number of relevant student leadership roles; student led events; establishment of social structures/roles; the school rebuild; changes to physical infrastructure; curriculum or teaching units; Rumaki events/actions; actions or appointment of significant people; externally focused activities/interactions. The first author then further organized this information in relation to the sub-systems/components identified by the interviews. We also noted how particular components or subsystems strengthened or waned over time, the relationships and feedback loops between sub-systems/components, and evidence of the emergent properties identified in the interviews. Table 1 shows the trajectory toward the current sub-systems and components revealed by this process. Our analysis of relationships between sub-systems/components and emergent properties (which drew on the two datasets equally) is discussed in the third and fourth part of the results section to follow.

Table 1 Summary and trajectory of the sustainable social system (SSS) at WSCW

	Summary of the SSS in 2018/2019	Trajectory 2007[a] - 2018
Student leadership	*Wises/Kaitiakitanga Teams* • The English-medium school has Wastewise, Travelwise, and Healthwise teams each with three Year 13[b] student leaders, one or two liaison teachers and a panel of more junior students. The Rumaki has a Kaitiakitanga group with a similar structure • There is an annual Wises/Kaitiakitanga camp, which includes team building, talks by experts and project planning • The teams run *events*, the more established ones are described in the adjacent column • The teams also attend and assist with external events, for example, in 2019 the Kaitiakitanga group visited Ihumātao, a disputed site occupied by local Māori and their supporters, to help them "use their waste bins correctly" (student leader) • The teams *communicate* sustainability issues to peers. This includes the following: a) advertising events via posters, assemblies and social media b) campaigns focused on the waste system that involve surveying their peers' knowledge of what goes in each bin, creating signage, positive modeling, showing their peers the correct bin to use, holding an orientation session for incoming Year 9[b] students, regularly feeding the worm farm with food scraps	In 2007, a Year 12[b] student set up an Environment Club that lasted 2 years. The first two school Environment student leaders were appointed in 2008, in 2009 & 2010 three Environment student leaders were appointed. In 2007, the school joined Auckland Council's Travelwise programme and formed a Travelwise group of students with a liaison teacher. From 2008 to 2011, the Environment student leaders (and in 2011 the Wastewise leaders) worked closely with the facilitator from Auckland Council's WasteWise programme The minutes show clear evidence of a student led process from the outset, closely supported by the Enviroschools[c] facilitator, research team, teachers and outside agencies. Student leaders have been involved in the design and maintenance of the waste system (from 2009), travel surveys and events to promote sustainable transport modes (from 2007), an annual sustainable/healthy "Master Chef" competition (from 2013), stream clean-ups and riparian planting (from 2010), an annual "Green Jam" for Auckland secondary schools hosted by WSCW (from 2013) and led numerous other events for their peers including "Eco" or Wises "Weeks." They also had input to the design of the school's rebuild via developing a vision in 2014 and communicating with or meeting the architects on a number of occasions A sustainability prize was introduced in 2008 and awarded to a student leader or one of the teams. From 2014, this has been under discussion in recognition of the collaborative nature of sustainability
Teacher leadership	*Wises/Kaitiakitanga liaison teachers* • Each student leadership team has liaison teachers, supported by the *Senior Manager Sustainability* *Classroom teaching*. Teachers lead sustainability-related curriculum developments. These include: a) classes in Level 2 & 3 NCEA[d] Environmental Science b) sustainability-related material in several subjects, for example, a biannual sustainability market in junior Social Studies, a 10-week unit on local ecosystems in Year 9[b] Science that includes learning about the school's worm farm, and data analysis on students' travel modes in senior Statistics *Student management* • Teachers encourage correct use of the waste system, for example, through form class litter clean-ups. *School operations* • Teachers design and promote sustainability-related improvements to school practice, for example, a sustainability guide for education outside the classroom (EOTC)	In 2009, the first liaison teacher was appointed to support the Environment student leaders, this role continued until 2011 when it was replaced with the Senior Manager Sustainability and the current liaison roles. Teachers have also led extra-curricular clubs and events. For example, one teacher introduced an "Ecowarriors" group that ran from 2014 to 2017, and another a "Trash to Fash" fashion show that ran from 2008 to 2014 The minutes record numerous sustainability-related teaching initiatives In 2010, the "Gifted and Talented" programme for Year 9[b] students focused on the new waste stations. Attempts to introduce NCEA[d] Environmental Science began in 2009, a Level 2 option was first delivered in 2011 with Level 3 following in 2012. Science teachers have led weeding and planting around the school's stream and associated funding applications from 2010 Teachers have helped manage correct use of the waste stations and worm farm since their implementation and the minutes in every year record teachers' attempts to influence school operations in areas such as transport, energy and waste management. Science, Social Studies, and Maths teachers have played a prominent role in the development of the SSS
Waste system	There is a *three-bin system* with: • waste stations outdoors and in the kitchens that separate compost, landfill & recycling • a *worm farm* and bokashi The *grounds staff* spend 40 h a week managing the waste system and helping students understand and use it correctly	Some recycling bins were introduced in 2007 by the Year 12[b] student who set up the Environment Club. Wooden waste stations designed by the 2009 Environment student leaders with compost, landfill, and recycling compartments were used in 2010 & 2011. The school obtained a Ministry for the Environment grant for $60,000 in 2011 for the current system The grounds staff were described as pivotal to the success of the three-bin system by interviewees, taking responsibility for managing the waste and involving students from the beginning

Table 1. Continued

	Summary of the SSS in 2018/2019	Trajectory 2007[a] - 2018
Rumaki	The *Rumaki* is the Māori immersion "school within the school" and according to several interviewees helps provide a *kaupapa* (purpose or philosophy) and cultural mandate for sustainability practices	From the outset, Rumaki students were included in the Wises teams, holding leadership positions in some years. With the establishment of the Kaitiakitanga group, the meeting minutes began to record a number of activities specific to the Rumaki. There is consistent evidence of collaboration between all the student teams
Rebuild of school	At the time of the interviews, the school was undergoing a major *rebuild*, managed by the Co-governance Board. It won an award for "Best in Education Architecture" in 2020 and has several sustainability features, for example, • Rainwater harvesting and the use of surface swales for stormwater • Heat recovery and dissipation measures, for example, extra insulation, double-glazing, sun-shading • The use of sustainable materials, for example, NZ pine interiors and materials with a high degree of recycled content • In 2021, a major fundraising campaign resulted in the installation of 136 solar panels for energy production	Discussion of the school rebuild began in the first year of the Sustainability Panel, led by the Governance Board representative. This representative was replaced in 2011 by a board chair who continued to advocate for green building standards. The rebuild appears frequently in the minutes over the entire period, for example, through discussions of a waste free canteen, more prominent worm farms, better and more visible bike parking, reduced car parks, funding of solar panels, reuse of materials from demolition, and how best to have input to the design process
Governance and management	All the SSS sub-systems are supported via *values*, *policy and resources* approved by the *Co-governance Board* and *principals*, for example, • The current school mission introduced in 2017 refers to "the building of a just and sustainable society." • The current principals are widely recognized as "passionate" about sustainability (a teacher's description), "good role model[s]" (a student's description) and highly supportive of leadership in this area • One of the deputy principals is the *Senior Manager Sustainability*; this role provides a direct link between management and the student and teacher sustainability leadership sub-systems The chair of the Co-governance Board also sits on the Sustainability Panel	The first sustainability-related strategic goal was introduced by the Governance Board in 2007, to: "Work towards environmentally sustainable practices in all areas of school life." The board then set up the Sustainability Panel to implement the goal. The panel had a member of the school's senior management team (a deputy principal, who is now the English-medium school's principal) and a board representative from the outset, in 2011 the role of Senior Manager Sustainability was formalized and given a time allocation by the principal. To our knowledge, this role does not exist in other New Zealand schools Notably the board representatives on the panel from 2010 to 2014 and from 2015 to the time of writing were also the board chair A goal to reduce waste to landfill by 50% was set by the board in 2011/2012, with a 73% reduction achieved In 2017, the Wises/Kaitiakitanga leaders had significant input to the wording of the current mission statement The school rebuild was a major responsibility for the board throughout the 11-year period. The panel minutes record regular discussion of the rebuild, led by the board representative
External governance GoGovgovernance components	*The New Zealand school curriculum* enables teaching on sustainability, for example, • One of the six principles is "future focus." • One of the eight values is "ecological sustainability." • The primary qualification offered, NCEA[b], offers sustainability-related credits. The *Ministry of Education* owns WSWC and funded the school rebuild to include several of the sustainability features outlined above.	Direct discussion of the New Zealand school curriculum did not appear in panel meeting minutes. It appeared taken for granted that it enabled, although did not specifically require, teaching on sustainability topics. The Ministry of Education was, however, discussed as both an enabler/facilitator and a barrier to green building standards; a situation made more complex by a change of government and policy over the design phase.

Table 1. Continued

	Summary of the SSS in 2018/2019	Trajectory 2007[a] - 2018
External support	*Auckland City Council*: • funds the school's Enviroschools[c] facilitator • works with the Travelwise team, particularly on an annual travel survey of transport modes to school • provides an environmental leadership programme for students across Auckland; WSCW students attend every year and are thus linked to a *sustainable schools network* • assists with an inter-school Green Jam hosted by WSCW since 2011 The *Parent Action Group* (PAG): • regularly funds sustainability projects at the school • runs a waste free event for new families each year The *research team:* • attends Sustainability Panel meetings • assists with documenting and reflection on the SSS (such as through the current study) • participates in the Wises camp and Green Jam and offers workshops on the psychology of sustainability The *local community*: • supports and attends events such as stream clean-ups and planting • is a source of funding, for example, for the solar panels mentioned above Several *other agencies* have supported the SSS as documented in the adjacent column. The most recent examples include input from *Pare Kore* (a Māori waste minimization team) on waste management, and *For the Love of Bees* on developing bee-friendly gardens	Auckland City Council features strongly in the minutes. The same council funded Enviroschools[c] facilitator has been involved from 2007, and the council offered Travelwise and Wastewise programmes that were integral in the early years, with ongoing assistance from the council's transport division apparent throughout. Several WSCW students have attended an environmental leadership programme for secondary school students run by the council (see AUTHORS, 2019), and it is clear this directly prompted student led events and activities. The school received highly commended in the youth category of the regional council's sustainability awards in 2009 and the 2015 Travelwise team received a Silver Award from Auckland City Council's transport division. The school received a bronze Enviroschools[c] award in 2008, silver in 2012 and green gold in 2014 PAG helped fund the first waste stations and financially supported other initiatives over the years, including $2500 for planter boxes in 2015 The research team did interviews, surveys and/or field experiments to help understand and/or grow the school's sustainability culture in 2008, 2009, 2010, 2011, 2012, 2013, and 2015. From 2007 to 2013, the team worked closely with the student leaders. In 2009, the second author supported the implementation of the wooden waste stations including by directing two short films to promote the waste stations and demonstrate correct use. The first author did several talks and workshops over the 11-year period including to assemblies, the staff, and at the Wises camp and Green Jam In 2012, the research team led a project to reduce littering (AUTHORS, 2016), this project was repeated by the Wastewise leaders the following year Several other agencies have played a role: The Ministry for the Environment funded the new waste system in 2011, small grants were received from various sources for riparian planting, and local businesses have sponsored events
Sustainability panel	The *Sustainability Panel* • Members are as follows: the Enviroschools[c] facilitator (currently the chair), the Wises and Kaitiakitanga leaders and their liaison teachers, other interested teachers, the Senior Manager Sustainability, a board representative, supporters from Auckland City Council programmes, the first author and research team • Meetings are open and regularly attended by the English-medium principal, previous panel members, and other support agencies or people with an interest in how it operates • It meets four times a year after school, with afternoon tea provided by the chair • The panel rarely generates projects directly, it is treated as a gathering place for people from different parts of the SSS to report on their activities, talk through proposals and gain practical and emotional support	The first author established the Sustainability Panel in 2008, after an invitation from the board and chaired it until the end of 2017. From 2008, the panel has had the same official structure and met four times a year. However, the number attending meetings has grown substantially. In 2008, three of the meetings were attended by 5 – 6 people, 2 – 3 of which were the first author and members of the research team, one meeting had nine people. In 2017 & 2018, the smallest meetings were 13 people, with some meetings of 19 participants

[a]The trajectory begins in 2007, 1 year before the beginning of the PAR project, as this is when the first sustainability goal was set.
[b]Students in New Zealand secondary (high) schools are aged from 12/13 to 17/18 years and are in Years 9–13.
[c]Enviroschools is a nationwide programme that supports schools to adopt a whole school approach to sustainability.
[d]NCEA is the National Certificate of Educational Achievement and is offered at all public schools with Level 1 in Year 11, Level 2 in Year 12 and Level 3 in Year 13.

When necessary, we verified dates and other details with a current member of the school staff or the chair of the Sustainability Panel. Table 1 and a complete draft of this article were also sent to the school's principals, and several members of the Sustainability Panel for feedback before they were finalized. All feedback was incorporated. We have no conflicts of interest to report.

Results

First we provide a map of, and describe, the sub-systems and components of the sustainable social system (SSS) as of 2018/19 (RAa). Second, we describe the trajectory toward the SSS (RAb). Third, we discuss the relationships and feedback loops between the sub-systems/components (the first part of RAc); fourth, we discuss the emergent properties of culture and identity (the second part of RAc); and finally, we describe features that may have been particularly influential in the development and resilience of the SSS (RAd).

The Sub-Systems and Components of the SSS

Figure 1 shows a map that captures the *pattern* of the SSS. *Components* are represented by a single box. These are coded to indicate whether they are primarily a group of *people*; an *activity*; part of the physical *infrastructure* of the school; or whether they help set and maintain the *purpose* of the SSS. This is, necessarily, a simplified representation. For example, the three bin system, while coded as infrastructure is also something people do (an activity) and is particularly time consuming for the grounds staff who maintain it. We felt, however, that it was best represented as infrastructure as its tangible presence is a key part of the SSS as portrayed in the interviews and Sustainability Panel minutes. Sub-systems are circled; these are clusters of components that further reveal the pattern of the SSS. Only strong links between components are shown (as adjoining lines). There are numerous other linkages within the SSS, some of these are discussed later. As almost all the components have links to the Sustainability Panel, these are not shown to allow more specific links to be readily identified.

Here, we briefly describe the sub-systems and components shown on Figure 1, readers are referred to Table 1 for more detail. The *student leadership* sub-system is comprised of three *Wises teams* made up of students from across WSCW known as Wastewise, Travelwise, and Healthwise; and a *Kaitiakitanga* group based in the *Rumaki*, as indicated by the adjoining line. Each team runs sustainability *events* and *communicates* with the larger student body, while also working closely with each other. The teams have *liaison teachers* who are situated in both the *student* and *teacher leadership* sub-systems. Teachers also provide sustainability-related *classroom teaching* which is linked to the *New Zealand School Curriculum* that facilitates teaching on this topic (discussed as an external governance component on Table 1). Teachers *manage students* particularly in relation to the waste system and have designed sustainability improvements to *school operations*. As will be outlined in detail later, the *Rumaki* plays an important role in the purpose of the SSS, through its emphasis on *Mātauranga Māori* (Māori knowledge). The *waste system* includes outdoor stations (the *three-bin system*) each with a compost, recycling, and landfill bin; and a *worm farm*, all managed by the *grounds staff*.

The school was undergoing a major *rebuild* from 2017 to 2019, and this has several sustainability features as detailed in Table 1. The rebuild is linked to the *Co-governance Board* that lobbied for sustainability features over the 10-year design period, and the *Ministry of Education*, an external governance component that approved and paid for these features. The *governance and management* sub-system includes a *Senior Manager Sustainability* who works directly with the teachers and student leaders. This role is *resourced* via a time allowance and is, to our knowledge, unique to this school. The *principals* and *Co-governance Board* are highly supportive of sustainability initiatives. Sustainability is mentioned in the school's mission statement and is a core *value* that appears in other *policies*. Along the left side of the map are significant support components that sit outside the main action hubs of the SSS. These are *Auckland City Council*, a *sustainable schools network*, the school's *Parent Action Group* (which is internal to the school so indented), the university-based *research team*, and the *local community/other agencies*. In the middle of the map is the *Sustainability Panel,* a key bridging site for the SSS. The membership and structure of the Panel has been outlined earlier, and its importance to the SSS will be elaborated in the discussion.

The Trajectory Toward the SSS

The trajectory that resulted in the current sub-systems and components of the SSS is detailed on Table 1. Even as insiders who had "been there," we were surprised by the extent to which the Sustainability Panel minutes revealed that the current system had been foreshadowed by, and thus appeared to emerge from, earlier structures and discussions. For example, the student leadership structure of Wastewise, Travelwise, and Healthwise teams introduced in 2011 was preceded by participation in Auckland City Council's Travelwise and WasteWise programmes, with the former creating a group of Travelwise students and liaison teacher two years prior.

Teachers were also introducing classroom teaching and extra-curricular opportunities for students throughout. While many of these eventually faded away, the overall picture suggests an increasing emphasis on, and entrenchment of, opportunities for students to learn about sustainability issues. Senior classes in Environmental Science were initially discussed in 2009 and introduced in 2011 and 2012; teaching on local ecosystems in junior Science is entwined with teacher-led initiatives to maintain the health of the local streams that appear in the minutes from 2010; and a biannual Social Studies sustainability market was a project initiated in part by the same teacher who led an "Ecowarriors" group for three years, that, among other activities, made and distributed beeswax wraps.

As a final example, discussion of the desirability of sustainability features in the school's rebuild, which eventually took place from 2017 to 2019, began in 2008, the first year of the Sustainability Panel. It is notable that the panel always included a member of the school's Governance/Co-governance Board and that the three consecutive board representatives were all diligent at attending panel meetings.

Communication and Positive Feedback Loops

Throughout the interviews and minutes, there were numerous examples of how the sub-systems and components of the SSS both developed, and now exist, in relationship to each other. In fact, while each sub-system and component came across as a meaningful unit within the larger SSS, the communication between the units was remarkable, suggesting ongoing exchanges that created positive feedback loops. Below is an extract from the interview with an ex-chair of the Governance Board that illustrates this through the way in which the goal to achieve a 50% reduction in waste to landfill in 2012 was embraced by the SSS.

> I was elected to the [Governance Board] and one of the things that I wanted to try and challenge the school about [was] the amount of waste going to landfill… I discussed this with the [English-medium] principal and put a remit to the board of a 50% reduction… within 12 months. I wasn't quite sure as to how this figure was going to work but anyway… the school achieved I think it was 78% reduction in waste to landfill in that 12 month period. There was a really passionate member of staff, who was [the Senior Manager Sustainability], at the time. She applied for a Ministry for the Environment waste reduction grant … and that grant was $57,000 from memory and that enabled the engagement of a consultant, Waste Not Consulting. WNC audited the school's waste. Then it was about engaging the kids… Students designed the signage, sourced a commercial worm farm, got the [grounds staff] on board – this was all within that 12 months. That was just unreal, it was way above my expectations… but always in the background the Sustainability Panel would meet once every term and on it were students, people from [Auckland City] Council, and [the first author], someone like me from the [Governance Board], and so we'd discuss issues on the three main threads of the Wises panels.

As can be seen in this example, the Governance Board, English-medium principal, Senior Manager Sustainability, Wises teams/students, grounds staff, Sustainability Panel, research team leader, and external supporters (Waste Not Consulting, Auckland City Council and the Ministry for the Environment) all assisted each other in achieving the waste reduction goal and thus produced accelerated momentum toward change. While this extract refers to 2012, the waste management system made an appearance in all the interviews with current school members and was frequently discussed in the panel minutes: Science teachers took their classes to visit the worm farm, the Kaitiakitanga group regularly fed the worms, a tour of the worm farm was included in the inter-school Green Jam hosted by WSCW, one of the grounds staff built a transportable waste station for use at sports events, and the waste system was in the plans for the school rebuild. Furthermore, while the 50% landfill reduction goal was formally introduced by the board, it came after the 2009 student leaders, with assistance from the second author and input from their peers at a series of events, had designed, built, and promoted wooden waste stations that were the school's first attempt to fully divert food scraps and recycling from landfill.

Teachers and students interested in sustainability also formed a feedback loop in which they strengthened each other. In the interviews, both current and ex-students mentioned the practical support and encouragement received from teachers (e.g., in organizing events), and teachers talked of being inspired by the "passion" of students. The Governance and Management sub-system facilitated all the other sub-systems with appropriate policies and the active involvement of board members in the SSS; and external groups, in particular Auckland City Council and the sustainable schools network, provided practical support and the sense that WSCW was part of a community that cared about these issues. Together, the various components and their relationships created something more than the sum of their parts: emergent properties.

Emergent Properties

The SSS appeared to form a web of support for, and facilitation of, sustainability initiatives that are, we suggest,

indicative of an emergent sustainability culture. Here, for example, is an extract from the panel minutes in May 2015, at which student leaders raised issues about the school's canteen:

> We discussed our concerns about plastic wrapping and food that is high in sugar. Also the possibility of more vegetarian options was raised. We agreed that we would like to see more healthy options and less packaging (especially use of plastic wrap), but that we would focus on the waste issue in the first instance. A team was organized of [name of Wastewise student leader], [name of student in Ecowarriors group] and [name of Healthwise student leader], who will organize a meeting with [name of canteen manager], with [name of Senior Manager Sustainability's] help. [Name of Enviroschools facilitator] also advised that she was willing to help and [name of Auckland Council Waste facilitator] will see what resources there are at the council that may be of use.

As this extract illustrates, and the minutes are full of similar examples, this is a "can do" culture, that is highly collaborative and solution focused. Furthermore, many of the students interviewed used language that implied the SSS had influenced the ethos of the school as a whole. For example, one of the Wises leaders referred to, "... this *personality* for our school that we are sustainable" and another described, "...our attitude toward sustainability and like, that being... a *source of pride* for the school." A Kaitiakitanga leader said that sustainability at the school is "like a *chain*." Many of the adults interviewed talked of the interplay between different levels at the school as leading to, and indicating that, sustainability has broadly taken root at WSWC. For example, the former Senior Manager Sustainability said in her interview that "the role modelling from [a previous principal] and the rest of the senior leadership team, combined with students living and breathing sustainability [and] parental support ... shift[ed] the culture quite dramatically."

As with all schools, WSCW has, in the words of the English-medium principal, a "population that is not constant and changes." This flow of students (key inputs to the system) and to a lesser extent staff, means that "you have to constantly reaffirm your practice and philosophy." On the one hand, this need to educate newcomers is time-consuming. On the other hand, it means that the story that "we are a sustainable school" is constantly rehearsed. One example is that the Wises leaders teach correct use of the bins to incoming students through collaboration with the Peer Sexuality Support programme.

The sustainability culture identified here is by no means all encompassing. All the interviewees spoke of gaps, frustrations, and/or the sense of not making progress at times. For example, student leaders talked about an ongoing problem with both litter and other students putting rubbish in the "wrong" bin, which they described as due to "laziness," a "mind set," or because "breaking the rules makes people look cooler" (although the June 2020 Sustainability Panel minutes record a substantial drop in littering with the completion of the new school buildings). Many of the teachers discussed "time," "energy," and "resource" limitations and one of the teachers said they were on a "plateau." We also acknowledge that our data come from sources within the SSS. We did not interview or survey potentially disinterested members of the school community. Nevertheless, there was a sense that sustainability is not simply a project at the school but, albeit imperfectly, part of what the school is. That is, sustainability is evident in the pattern and process of the school, helping create the system's dominant form.

There was also evidence that the SSS promoted sustainability identities. When asked if the school has made them someone who cares about sustainability, all the interviewees responded that it had either done so directly or was part of a web of influences. Crucially, the SSS appeared to welcome and strengthen incomers' existing sustainability identities via being able to join a team, co-construct and participate in events, and receive teaching on sustainability issues. One Wises leader talked of being given "agency" with regard to "exploring" sustainability. An ex-student said that the school "creat[ed] opportunities for young people, who are like already on that kind of journey to engage and to contribute." The adults talked of the school "reinforcing" and "solidifying" an existing identity, learning from others at the school, and one teacher said she had been attracted to the school because of its orientation toward sustainability.

In summary, the data suggest positive feedback loops in which sustainability identities are welcomed by a sustainability culture, enabling those with these identities to grow the culture, which in turn strengthens their identity as actors for sustainability. The SSS also appears to have broadened its sphere of influence over time, suggesting a phase transition in which sustainability has become part of the school's story of itself, helping to orient its purpose and activities.

Key Features that Promoted Change and Resilience

Here, we offer seven features that may have been of particular significance in contributing to change, growth and resilience within the SSS (our final research aim, RAd), and re-engage with related literature. Given that we are (a) referring to a complex social system that is subject to non-linearity, and (b) combining observations from the

case study with broader insights from the literature, we acknowledge the shift from a highly data driven analysis into one that is somewhat more theoretical and hence, tentative.

A Pre-Existing Culture that Encouraged Innovation Throughout the Social Network. The Sustainability Panel encourages students and staff with sustainability interests to work through their own ideas; seeing them as "change agent[s] with the ability of exercising discretion in choosing to act" (Sol et al., 2018, p. 1389). This assumption of agency is in keeping with the school's view of its educational task. Throughout the interviews, there was regular reference to students as not just consumers of knowledge but as co-creators of the way the school runs, an assumption that Manuel Riemer et al. (2014) argue underpins meaningful youth engagement in environmental transformation. For example, a current teacher described how "student decisions are important [at WSCW]" and that they "are given the opportunity… if you want to start a club you go and start a club…."

There were numerous entries in the Sustainability Panel minutes of student suggestions that were picked up and supported by adults, an example related to plastic wrap was given earlier. In many human institutions, hierarchy and its corresponding bureaucracy take precedence over ideas and flexibility (Harré, 2018a). Indeed, ideas are often not noticed unless they come from the right place, in the right form, at the time requested by the relevant manager. At WSCW, there was already the expectation that valuable initiatives may come from anywhere in the social network. This assumption may have allowed the openness necessary for the new value of sustainability to become embedded at the school.

The Presence of the Māori Language Immersion School (Rumaki). As outlined previously, WSCW is a bicultural school. It is likely the SSS is strengthened by the presence of the Rumaki. The natural environment is central to traditional Māori culture, which encourages a strong sense of responsibility for place (Marsden, 2003; Roberts, Norman, Minhinnick, Wihongi, & Kirkwood, 1995). At WSCW a Māori way of being is enacted by a portion of the school community and observed by others. As one teacher from the English-medium school said (Māori terms emphasized):

> We as *kaiako* [teachers] are exposed to *te reo* [the language] Māori every day… From school briefing to *karakia* [prayers]… and actually what I am learning is that sustainability of the Earth but also of people, is woven through *te ao* [the world] Māori, like it's just there, yeah, that's definitely a huge advantage of us being here at [WSCW] because we've got [the Rumaki] right with us.

The Kaitiakitanga leaders were also aware of their role as perceived leaders on environmental issues. One said, "I feel like… the whole world is starting to turn to indigenous people in terms of how to… [fix this]… we've known this stuff for ages." Sustainability then, is consistent with the core *kaupapa* [philosophy/approach] of the school. This does not mean care for the environment always takes precedence. WSCW sits within a wealthy, industrialized nation and is subject to numerous competing priorities, especially the students' achievement in national qualifications. But it does mean that sustainability is taken seriously and calls for action by advocates cannot be easily sidelined.

The Creation of a People-Focused Bridging Structure. The Sustainability Panel provides a crucial bridging structure facilitating communication between people with sustainability interests from various parts of the school. Each of the key sub-systems shown on Figure 1 has within it strong links between the people involved. They recognize themselves as a group with a shared purpose and see each other regularly. These people, in turn, are strongly linked to other groups in the school that are not shown on the map. For example, teachers are strongly linked to all the students in their classes, and students to their friends who are not in the Wises/Kaitiakitanga teams. Strong links provide numerous opportunities for influence, and a large body of research on social contagion has shown that densely networked groups tend to change together (Christakis & Fowler, 2013). By bringing together people from different subsystems at the school, the Sustainability Panel creates bridging links (see Newman & Dale, 2005) with sustainability as the common purpose. As noted by Penelope Hawe such links provide "exposure to and transfer of different types of information assisting people to transition out of particular behavior patterns or situations" (Hawe, 2017, p. 92).

In keeping with a people-focused approach, the panel does not set all-encompassing collective goals or expect members to work on a single project. Instead, it gathers up different components (see Mason, 2008), notices the activities of members and creates a narrative of "us" as sustainability advocates that invites more action in line with that narrative. This emphasis on diversity is likely to both enhance the resilience of the SSS as discussed earlier, and encourage participants to bring their strengths to the table and receive support in negotiating school politics, classic requirements of empowerment (Christens, 2012; Perkins & Zimmerman, 1995). It also encourages critical reflection on what is and is not working. Difficult emotions, fears, and failures are regularly discussed and normalized as part of what it means to be a sustainability advocate.

Pivotal People. A number of people have provided critical impetus to the SSS, acting as large new inputs. These include members of the research team, the Enviroschools facilitator, dedicated teachers, innovative students, the groundsman who manages the separated waste system, the first Senior Manager Sustainability who set up the Wises leadership structure, governance board chairs, and supportive principals. It is hard to imagine the SSS without any one of these people and indeed the importance of sustainability champions to organizational change is widely acknowledged (e.g., Bertels et al., 2010; Hargreaves, 2011). However, it is important to recognize the interplay between identity and culture discussed earlier. It is likely that most organizations have potential sustainability champions. But if they are in a hostile environment with negative feedback loops that maintain the status quo, their efforts will fade away. At WSCW, the efforts of pivotal people have been accentuated through positive feedback loops that grow the SSS. Pivotal people have also emerged from the SSS. For example, the first Senior Manager Sustainability did not come into her role as an experienced sustainability advocate. As she said, "...the people I worked with... all taught me a huge amount [about sustainability]." The SSS then, gives an opportunity for people with an inclination toward sustainability to develop that further, changing both themselves and the system.

The System is Made Up of Diverse Components and has Multiple Locations. The SSS map in Figure 1 shows different types of components: people, activities, physical infrastructure and purpose, and sub-systems that are located within different aspects of school life. This diversity of type and location helps give the SSS a degree of resilience; that is the tendency to maintain itself despite weaknesses within, or threats to, one part of the system (see Davidson, 2010; Hawe, 2017; Wilson, 2014). Diverse actors may be of particular importance to system resilience (Grêt-Regamey et al., 2019; Hawe, 2017). At WSCW the SSS includes people from multiple locations including the Co-governance Board and principals, teachers, grounds staff and students, as well as external supporters. Furthermore, the presence of physical infrastructure ensures sustainability is constantly visible. The waste system in particular functions as a behavioral trace signaling "what we do around here" (Harré, 2018b), even if key actors fade from sight. This diversity is not accidental; from the beginning the project welcomed and attempted to increase the visibility of all sustainability-related initiatives. And this approach appears to have been effective; if one aspect of the SSS weakens, the system as a whole is still maintained by other aspects.

Sustainability Worked Its Way into Essential Activities and Became Standard Practice. Throughout the 11 years covered here, sustainability initiatives became standard practice by working their way into essential activities. Three examples are the introduction of a separated waste system, Wises and Kaitiakitanga leaders becoming central to the student leadership structure, and Environmental Sustainability subject options for senior students. Each of these is reproduced year after year because there is waste to be managed, student leadership roles to be filled and classes to be taught. By being part of standard practice, they also bring with them accountability, resources, and provide an anchor for key sub-systems, something that *will* happen despite other fluctuations.

Notably, a change to standard practice either releases and redirects locked-in energy that was previously maintaining the status-quo (see Mason, 2008; Westley et al., 2007; Wilson, 2014), or introduces new energy by expanding the system. At WSCW both have happened. The school roll has steadily increased since 2008, making new student leadership portfolios and teaching subjects additions to, rather than replacements for, what was already in place. The extra funding received due to roll increases may have also made a much more complex and time-consuming waste management system seem feasible. Nevertheless, the default position of a rigid system that resists change, is to put any new energy to old uses. In this school, some energy has been re-directed toward new sustainability practices. This is not say that there is now ample space for sustainability advocates to do what they feel is needed. Some of the main barriers to sustainability teachers discussed were "time," "energy," and "resource" limitations, consistent with previous studies in environmental education (e.g., Evans, Whitehouse, & Gooch, 2012). Nevertheless, at least to some degree, sustainability is now locked into the organizational system.

Regular Sustainability Events. Finally, the SSS is kept buoyant through the events organized primarily by the student leaders. As argued by Tomas Pernecky, events "play a part in the structuring and maintaining of societies" (2013, p. 15). They can express values and strengthen a community's story of itself by enacting those values and providing bridging bonds between groups. Inspiring events can also show possible futures that attendees are encouraged to live into (Harré, 2013). As shown on Table 1, the SSS generates a considerable diversity of events. For example, in 2009, the project to create wooden waste stations that preceded the current three bin system involved a waste audit, mapping exercise, photography competition, music/dance video, painting, and an eco-day. Each event was designed to appeal to students with different interests, so that expectation was generated across the school, and the objects embodied a collective effort.

Events have also helped stretch the ambiguously bounded system toward the supporters shown on the left

side of Figure 1. For example, the inter-school Green Jam draws the sustainable schools network together; Auckland City Council offers a programme for environmental leaders (see Blythe & Harré, 2019), waste audits, and transport expos; and the local community is invited to stream clean-ups. This creates the sense that the school is not alone in their efforts but they "transcend beyond the school" in the words of a former student interviewed. In summary, while most events at WSCW and elsewhere do not directly contribute to structural change (the waste station events outlined here are an exception), they help reassert the story of the community and allow people to enact and grow that aspect of their identity.

Discussion

This project used a novel people-focused systems approach to promoting and documenting organizational sustainability in an 11-year partnership with Western Springs College/ Ngā Puna O Waiōrea (WSCW). We mapped the resulting sustainable social system (SSS), documented the system's trajectory, and have discussed its emergent properties and seven features that may have been especially important in promoting change. Now, we offer a set of general steps for a people-focused systems approach to organizational sustainability. We then reflect on systems thinking and the research process, and finish with comments on the limitations of this work and suggestions for future research.

Using a People-Focused Systems Approach to Sustainability

First, it is important to stress that the features we presented as key to forwarding sustainability at WSCW cannot be simply "applied" elsewhere; indeed, most were not "applied" at WSCW. Features one and two refer to favorable aspects of the school's pre-existing culture. The diversity of the SSS that it worked its way into core structures, and the presence of pivotal people (features four, five, and six) was encouraged, but by no means controlled, by the process. The bridging structure and its people-focused approach (the Sustainability Panel, feature three) was the only direct intervention; and regular events (feature seven) the most consistent collective output facilitated by the panel. Given that as a complex social system, the SSS discussed here emerged from an interplay of context, intention and serendipity; what can those wanting to promote organizational sustainability in other settings learn from this case? Figure 2 suggests five general steps for a people-focused systems approach that draw on our findings and reflections.

As stated in step one, the process must be led by insiders who care about sustainability. Notably, in the WSCW project, the first author was part of the school community as a parent for all 11 years covered here and initially also as a member of the governing board. The process cannot be led by the neutral change agent so often invoked by the variable-focused approaches that have dominated environmental psychology (e.g., Nielsen et al., 2020; Ones & Dilchert, 2012; Romero-Canyas & Hiltner, 2020). In addition, there must be some openness on the part of the organization as a whole; although it may be very difficult to judge in advance, if and in what domains, change is possible. Steps two and three emphasize identifying, bringing together, and supporting the people who care via a bridging structure with a people-focused culture. These steps recognize that the SSS expands and is resilient insofar as the self-selected change agents are connected and strengthened. The process is not necessarily "bottom up" in the traditional sense; pivotal people in the WSCW project were found in all layers of the formal hierarchy, and this added to the diversity of the SSS. Instead, it mimics the networks of complex systems (see Neal & Neal, 2013) and we have called the bridging structure outlined in step two a "sustainability network."

The process is, however, "inside out." It does not rally people around a pre-determined goal or restrict participation to representatives who may be there at a manager's behest. Instead, it pays attention to, and welcomes, whole people and the knowledge and capacity that comes with their institutional role. As we have argued previously, this democratic, inclusive process is inherent to a definition of sustainability focused on human and ecological flourishing (see Harré, 2018b; Wals, 2010); and helps prefigure the change it seeks. It is also consistent with community psychology's emphasis on individual and collective wellness (Prilleltensky, 2012), working with people's strengths and empowerment (Blythe et al., 2013; Christens, 2012; Perkins & Zimmerman, 1995; Riemer et al., 2020); and environmental education's emphasis on people growing and learning together (Wals & Dillon, 2013).

Steps four and five, increasing the visibility of the network's efforts and attempting to integrate sustainability with the organization's essential activities, reach beyond those who become active in the network. In doing so, they introduce the extra complexity of working with actors who may have little alignment with the network's purpose (see Capra & Luisi, 2014; Flood, 2006; Foster-Fishman & Watson, 2017; Stacey, 1996). Implicit to both steps is the encouragement of positive feedback loops that accentuate change and potentially result in a phase transition in which sustainability becomes part of the organization's purpose and pattern. Implementing these steps cannot be done through a grand plan (see Hassan, 2014),

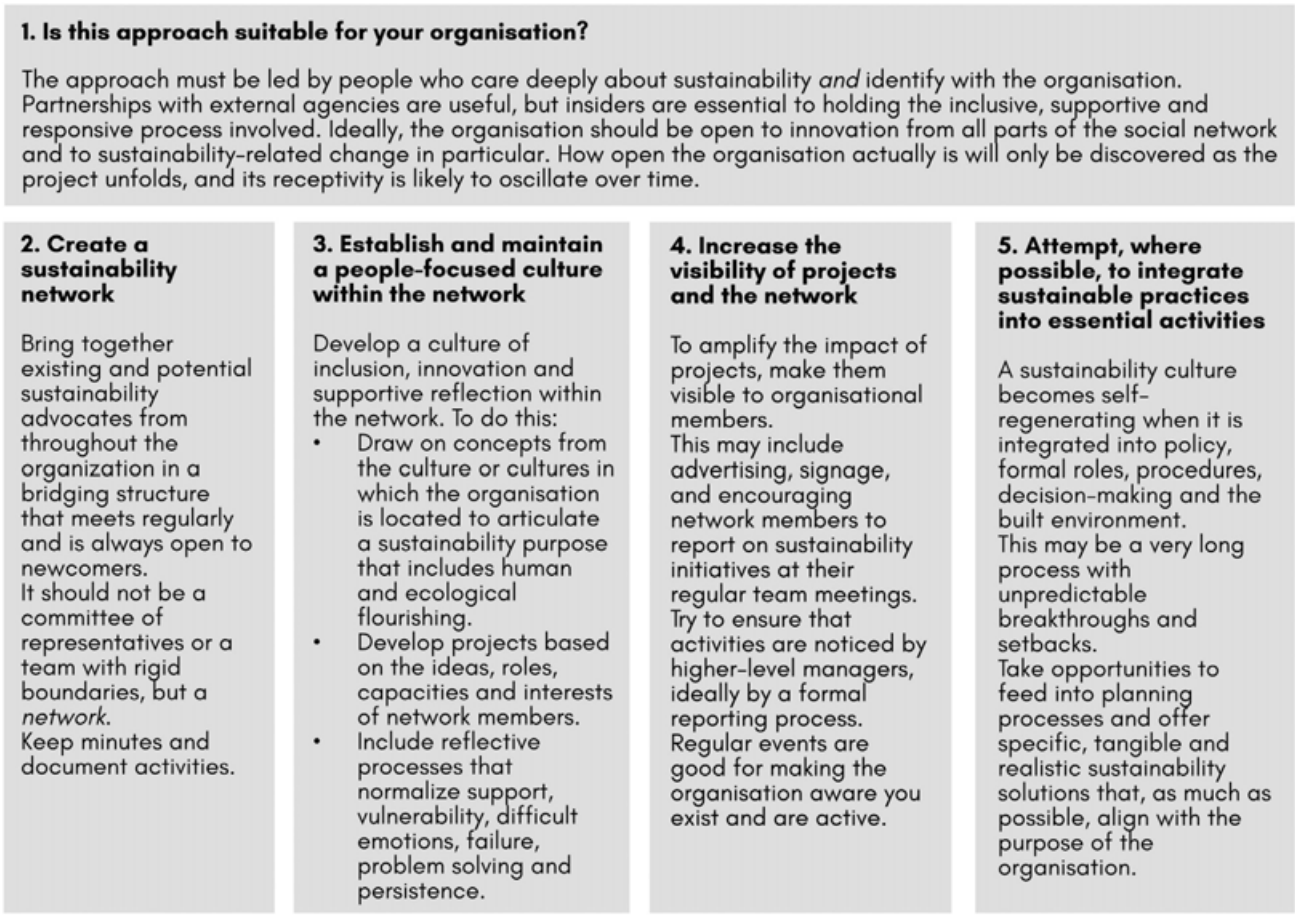

Figure 2 A people-focused systems approach to sustainability

but through a flexible, opportunistic process that looks for openings in the organization that align with the interests and capacities of network members.

Reflections on Systems Thinking as a Foundation for Action Research

We found systems thinking and the language it offers extremely helpful to both the "action" and "research" components of this project and a natural ally to principles from community psychology and environmental education. All three recognize the dynamic nature of social systems (e.g., Capra & Luisi, 2014; Checkland & Scholes, 1990; Hawe et al., 2009; Sol et al., 2018) and encourage recognition of the "spaces in between" people and other system components. When complexity is fully embraced, it encourages budding change agents to "work" these spaces in an attempt to amplify impulses toward transformation. At the same time, the mapping procedure we used, loosely based on soft systems methodology (Checkland & Scholes, 1990), enabled us to show and describe the sustainable school system in a concrete form that was instantly recognizable to the school and has allowed us to share their story with others. Finally, systems thinking facilitated our capacity to notice and support those who yearned for change, regardless of their location within the system. This encouraged us to side-step assumptions about power hierarchies that may sometimes limit community psychology approaches (see Harré, 2019).

On the other hand, systems thinking is an enormously complex field, with highly technical terms and modeling procedures that may disempower actors in real settings. Here, with our determination to create a people-focused process in keeping with the core values of community psychology and environmental education, we have chosen language and created a process that is relatively accessible. Ironically perhaps, the simplicity of our approach to complexity appeared to facilitate insider-led change; we are not suggesting all applications of systems thinking would do the same.

Limitations and Future Research

We have discussed just one organization, a school in Aotearoa New Zealand, and the SSS described here has

features specific to schools in general and New Zealand schools in particular, as well as to the available resources, physical location, and change agents involved in *this* school over *this* 11-year duration. It is unclear whether, and to what extent, our proposed people-focused approach can be used in other settings. (Note that the first two authors, in separate roles, have both successfully applied this approach at their university. For an example, see www.auckland.ac.nz/en/science/about-the-faculty/sustainability.) In this article, we have also, deliberately, focused on what worked. This was reflected in our research aims, the data we gathered, and that our analysis was conducted in partnership with members of the school active in the SSS. In this sense, WSCW is almost certainly portrayed here as more sustainable than it "really" is, and we have given readers only minimal insight into the many struggles and barriers experienced as part of the project. Interviews with members of the school community not involved in sustainability would certainly add important insight into the reach and limitations of the SSS. Our intent, however, was never to evaluate the project per se, but to describe the SSS within it, and how its elements and relationships developed over time.

We suggest that simply sharing the maps, trajectories, and key underlying features of different SSS through case studies such as ours is useful and can provide an increasingly nuanced picture of the sustainable organization. In a practical sense too, such case studies offer examples of what has worked *somewhere*, and so offer possibilities that may resonate with, and be adapted by, those in other settings. In this case, features such as the student leadership structure at WSCW may appeal, and be seen as feasible, to sustainability advocates in other schools. Finally, while the WSCW project as a whole cannot be meaningfully "replicated" or "scaled" (notions that also do not sit well with our interest in inclusive, democratic processes or with the dynamics of complex social systems), researchers may be inspired to partner with an interested organization and fine-tune the people-focused systems approach proposed.

Conclusion

To our knowledge, this study is unique in outlining a people-focused systems approach that combines systems thinking with the values and skills of community psychology, in an attempt to promote and understand the "sustainable social system" (SSS) in a high school. We have treated WSCW as an exemplary case of a sustainable organization, not in order to prove that it "is" sustainable, but to try and identify why sustainability has, albeit imperfectly, taken root there. In keeping with the both the non-linearity of complex social systems and our interest in inclusive, democratic approaches, we do not claim the findings from this project can be directly applied elsewhere. However, we have suggested steps toward implementing a people-focused systems approach in other organizations. Sustainability is a key issue of our time. We urge environmentally inclined and community psychologists to consider working alongside sustainability advocates within organizations as part of the collective effort to ensure human and ecological flourishing now and into the future.

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