Research

Voicing resilience through subjective well-being: community perspectives on responding to water stressors and COVID-19

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ABSTRACT. Interactions among social inequalities, environmental stressors, and shocks are illustrated through communities' subjective experiences of water-related challenges and responses to crises. This situation is perhaps most visible in the COVID-19 pandemic's impact on marginalized communities where climate change and systemic inequities are already threatening access to water and sanitation. It is critical to integrate dimensions related to well-being into research about vulnerable communities' capacities and strategies for coping and adapting to such crises. Here, we investigate water-related risks to health and well-being using a subjectivity lens, a particularly useful tool for understanding community-level resilience to lesser-known stressors and crisis impacts. To inform this study, we used households' self-reported water issues in Cape Town, South Africa's low-income areas from before the pandemic, in addition to community responses during the pandemic. The findings show how inadequate access to water and sanitation affects people's health and well-being, both directly by exposure to wastewater and impaired hygiene, and indirectly by creating stress and social conflict, and undermining subsistence gardening and medical self-care. However, our study also illustrates how grassroots-led responses to the COVID-19 crisis address these vulnerabilities and identify priorities for managing water to support well-being. The results demonstrate two ways that subjective perceptions of well-being can help to promote resilience: first, by identifying stressors that undermine community well-being and adaptive capacity; and second, by voicing community experiences that can help to guide crisis responses and initiatives critical for adapting to social-ecological shocks. The results have important implications for enabling transformative change that aligns efforts to address issues linked to poverty and inequality with those seeking to respond to environmental emergencies.

Key Words: *community-level adaptation; COVID-19; global South; social-ecological resilience; subjective well-being; transformative capacity; water justice*

INTRODUCTION

Water is fundamental for daily health and the overall function of society and the environment, making it a useful lens through which to study the links between global crises and resilience of the underlying social-ecological system. However, abstract concepts such as social-ecological systems sometimes fail to capture challenges in the lived realities of everyday water users. Water is multifunctional, as shown in the many ways it mediates interactions between humans and the rest of nature, and that fact also makes it subject to different preferences and prioritizations (Enqvist and Ziervogel 2020, United Nations 2021). These differences are partly a result of how people experience such interactions in their daily lives, depending on long-lasting social stressors (e.g., inequitable access to basic services) and exposure to climate risk (e.g., drought and flooding damaging people's homes and livelihoods; Mekonnen and Hoekstra 2016, Adams et al. 2020).

Individual, subjective perspectives can therefore be critical for understanding how water influences both climate risks and social stressors. Importantly, subjective experiences are shaped by factors that also influence people's agency and capacity to respond to such challenges (Djoudi et al. 2016, Sultana 2018, 2021). Social-ecological systems research therefore increasingly recognizes subjectivity as a tool to engage with how perceptions of transition and transformation are filtered through individual experiences and worldviews that shape people's responses and interactions with social-ecological dynamics (Stedman 2016, Steffen et al. 2020). Subjective perspectives thereby influence the conditions of social-ecological systems in ways that are hard to capture with ecological measures of resilience such as equilibria, thresholds,

and feedbacks (Olsson et al. 2015, Jones et al. 2021). Subjectivity speaks directly to the question of resilience "for whom and to what" (Carpenter et al. 2001, Meerow et al. 2016, Stedman 2016) and helps "to make visible the subtle, normalized, and invisible power dynamics present in communities" (Morales and Harris 2014:18).

One way to employ subjectivity to understand social-ecological resilience is through the notion of well-being. In his seminal piece, Folke (2016:13, our emphasis) defines resilience as, among other things, "the capacity to *develop and sustain human well-being* ... through adapting or transforming in response to change". Placing well-being as a key indicator of resilience, rather than confusing the two concepts as interchangeable (Chaigneau et al. 2022), makes subjectivity central to social-ecological systems research. The concept can be engaged with as a tool to measure and track well-being during shocks and disturbances (Stedman 2016, Jones and Tanner 2017, Ensor et al. 2021) and to explain regional differences in adaptation (Maxwell et al. 2015, Jones et al. 2021). Importantly, subjective perspectives also highlight how associating resilience with returning to a previous "normal" or "stable" state implies a "privileged claim, one that supports the views of those in power" (Stedman 2016:894). Developing and sustaining well-being is likely to require different actions depending on local perspectives on what challenges are most important (Chu et al. 2016, Aslam Saja et al. 2019).

This focus on well-being is particularly important in highly diverse or inequitable contexts in which a multitude of social dynamics, cultures, gender norms, and environmental characteristics make experiences of water-related challenges difficult to measure in

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both a consistent and a meaningful way. In Cape Town, South Africa, a drought-induced water crisis that peaked in 2018 caused many such intersecting stressors to compound everyday water challenges, with starkly different impacts on residents' well-being (Enqvist and Ziervogel 2019, Simpson et al. 2019, Ziervogel 2019*b*). These stressors were rooted partly in climate change, but also in persistent challenges in service delivery, especially in low-income areas where the unresolved legacy of race-based spatial inequality curtailed many households' ability to cope (Smith and Hanson 2003, Millington and Scheba 2021, Enqvist et al. 2022). In such situations, inadequately representing interacting social and environmental stressors risks causing generalizations about communities' vulnerability by overlooking links between power imbalances and impacts on community members (Arora-Jonsson 2011, Hellberg 2017, Khalikova et al. 2021). When applied to water-stressed environments, these generalizations fail to account for geographical marginalization and disproportionate exposure to flooding, pollution, and poor drainage (Allen et al. 2017) or the use of standardized measures of water accessibility that omit bespoke service provisioning common in informal settlements (Zawahri et al. 2011, Adams et al. 2020). For instance, Enqvist et al. (2022) found that Cape Town officials could understand communities' water issues better through personal, qualitative stories that helped describe the complex challenges that are difficult to capture with standard city surveys. Community-centered perspectives are therefore particularly important for determining primary objectives for transformation and reducing climate risk in highly informal and inequitable societies (Ziervogel 2019*a*), whether that informality stems from settlements' spatial structure or the way services are provided (Moksnes and Melin 2014, Frumkin et al. 2020).

During the early response to the COVID-19 outbreak in South Africa, authorities' difficulties in acknowledging informal arrangements adversely affected the most marginalized (Battersby 2020). By undermining social-ecological resilience, preexisting stressors such as social inequality and environmental degradation can magnify the effects of an emergency of that magnitude (Leach et al. 2018, Walker et al. 2020, Asayama et al. 2021). As a "crisis about life itself", the pandemic highlights social inequities as major obstacles to improving well-being and planetary sustainability (Horton 2020:1410). However, this idea also implies that responses to the pandemic present opportunities for transformative change (Horton 2020, Walker et al. 2020) if they can also address chronic stressors such as water injustice, food insecurity, housing inequality, and environmental risk (Leach et al. 2018, Díaz et al. 2019). Crucially, interventions to address such a complex set of nested issues require knowledge that draws on multiple and context-relevant perspectives (Caniglia et al. 2021, Ziervogel et al. 2022), acknowledging the "importance of context and embeddedness in the analysis" to ensure policy decisions that match the lived realities of people (Arora-Jonsson 2011:748). Specifically, we see great potential in using water as a lens to capture a more holistic understanding of well-being for society (Wutich et al. 2020), beyond health and sanitation concerns, to include factors such as civic participation and community vitality (Kangmennaang and Elliott 2021). Subjective, local perspectives play an important role in understanding vulnerability contexts and help to guide adaptation (Kangmennaang and Elliott 2021), for example, by

unpacking links between food and water insecurities or the effects of perceptions of water services injustice on mental health (Brewis et al. 2020).

Here, we use the water lens to examine impacts from and responses to two interacting crises, COVID-19 and climate change, against a backdrop of severe social inequities. We frame these interactions through people's subjective perspectives of water issues on their daily health and well-being. This focus on subjectivity responds to the growing need for bottom-up subjective perspectives in research, especially when addressing sustainability problems experienced by marginalized communities, which must be approached from their points of view (Maxwell et al. 2015). We explore the Cape Town case, in which residents' experiences of well-being have been shaped first by a water crisis and then by strict lockdowns. We structure our investigation around three research questions:

1. How do residents of Cape Town's low-income neighborhoods experience the impacts of water-related stressors on health and well-being?

2. How are communities responding to the effects of crises that affect water and well-being, in terms of understanding and supporting community well-being and resilience?

3. What lessons does the Cape Town case provide for using subjective well-being as a way to understand and promote social-ecological resilience in the face of multiple interlinked shocks and stressors?

Our case is exploratory and empirical, rather than built on preexisting theories. This approach is especially relevant given the rapid changes that unfold during a crisis. Therefore, value exists in conveying residents' perspectives on unfolding crisis events and the ties between water and well-being. This approach constructs a narrative of perspectives between local groups and existing research initiatives on how they perceive and engage with these challenges. Our study forms part of a transdisciplinary research project using a knowledge co-creation approach to empower local environmental activists and capture stories about communities' perceived experiences facing risks related to climate adaptation (Enqvist et al. 2022, Ziervogel et al. 2022). We focus on the subjective experience because it is increasingly clear that systems change requires "outer" transformations to occur in conjunction with "inner" ones, e.g., those relating to "consciousness, mindsets, values, worldviews, beliefs, spirituality and human–nature connectedness" (Woiwode et al. 2021:841). To some, the social construction of the system is "decisive in terms of institutional arrangements for addressing issues of global governance" (Bromley 2012:6). This structure makes engaging in subjectivity important for understanding sustainability challenges, especially to highlight community initiatives and worldviews for directing these ideas toward sustainable transformations.

Focusing specifically on urban water–well-being relations, we employ Brewis el al.'s (2020) biocultural framing to help explain interactions between social-environmental stressors while placing attention on the local context and how communities experience their environments and navigate threats. This framing allows us to focus on three levels within the urban social-ecological system: (1) the physical, including water- and climate-related risks; (2) the biological, concerning food insecurity and threat of disease and

Fig. 1. Most of the informal settlements in Cape Town, South Africa are located in the Cape Flats, east of the city center. Map overlay data source: City of Cape Town GIS Data - Creative Commons Attribution.
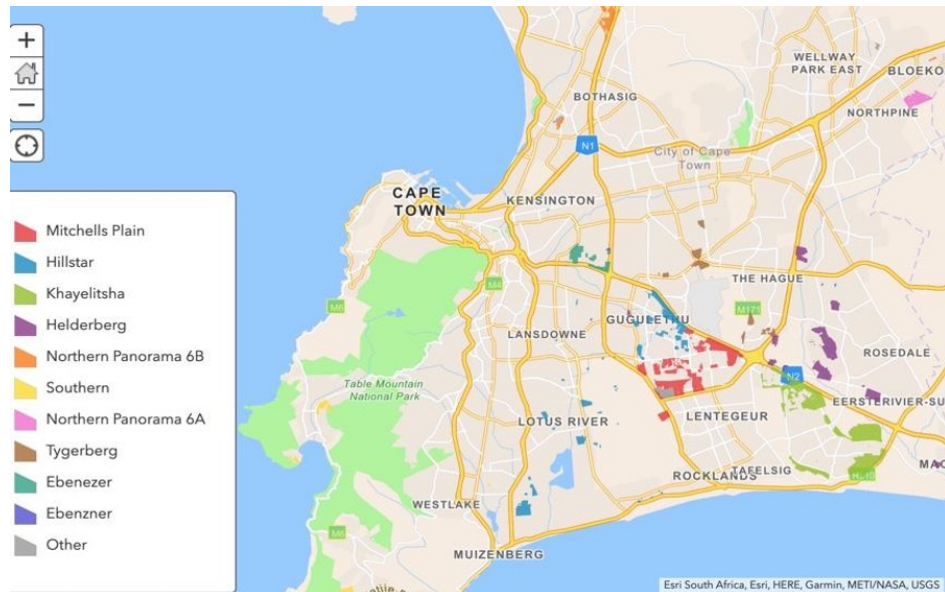
infection, for example; and (3) the sociocultural, which draws attention to social inequality emerging from case-specific variables such as living-environment inequities, gendered differences in water-related responsibilities, etc. (Brewis et al. 2020). Importantly, by linking biophysical and sociopolitical manifestations of water insecurity, a richer and more embodied understanding of its impacts on people's well-being can be captured. This work builds on previous cases, including Ennis-McMillan's (2001) *sufriendo del agua* (suffering from water), referring to the anger, frustration, worry, and other emotions associated with water stress, and Tallman's (2019) description of nonscarcity impacts on well-being in which water contamination contributes to depression and distress because of perceived injustice and unpredictability of clean water sources.

Applying these ideas to water in Cape Town helps us to elucidate how physical features (e.g., climate-driven drought and flooding) are intertwined with biology in the lockdown-induced food crisis, and sociocultural impacts of gender dynamics and the power imbalances inherent in the highly inequitable living circumstances experienced by residents.

METHODS

Study site
Cape Town presents an unusual but relevant case, with the same interacting climatic, health, and social crises that are likely to pose challenges in many of sub-Saharan Africa's rapidly growing cities (Dos Santos et al. 2017). Extremes in climate variability cause unpredictable rain patterns that exacerbate both droughts and floods (City of Cape Town 2018, Otto et al. 2018), with especially harsh effects in the low-lying and exposed Cape Flats, where many informal settlements and other low-income areas are located (Fig. 1). The Flats is home to many people of color who were forcibly

removed during apartheid, as well as migrants from rural areas seeking sustenance in the city. However, urbanization, low employment, and a lack of housing have led to an increase in informal living spaces, both through sprawl as dwellings are put up in unclaimed lands, and through densification as residents rent out backyard shacks to create extra income (Mahlanza et al. 2016, Ziervogel 2019*b*). Problems with infrastructure and water management have led to a lack of access to and inequitable distribution of water services (Enqvist and Ziervogel 2019). Until July 2017, all households were promised access to free basic water of 6000 L/mo at no cost; that changed to ensure continued revenue during the water crisis, when many affluent households brought their previous high water use below this threshold (Department of Water and Sanitation 2018, Visser and Brühl 2018). Currently, the rebate only applies to households registering as "indigent", a process so extensive that it effectively excludes many of the poorest households from the free basic water policy (Millington and Scheba 2021).

The selected study site also allows us to draw on recently collected data investigating long-standing challenges related to water service delivery in Cape Town's townships and informal settlements (Enqvist et al. 2022). These data were collected in 2019 by a local network of community activists in a transdisciplinary partnership with researchers at University of Cape Town. Using a co-designed methodology, the project aimed to support communities' work to ensure access to water services and to understand the water-related issues that residents face in their daily lives (Enqvist et al. 2022, Ziervogel et al. 2022; African Climate and Development Initiative project information: http://www.acdi.uct.ac.za/community-resilience-cape-town-corect). The project used a tool called SenseMaker, which, in addition to narratives, employs multiple-choice questions to allow respondents to "code" and give meaning to the story they share

(Lynam and Fletcher 2015, Metelerkamp et al. 2019, Enqvist et al. 2022). This process centers the analysis around the respondent and provides both qualitative and quantitative data to describe their subjective perspectives of water issues placed within the situational context. As co-produced knowledge, this process provides a unique access to residents' own experiences, which are used to inform both science and local advocacy work for community rights to water and sanitation services.

Research approach
Our study explores the phenomenology of water-related issues by examining the first-person perspective. In other words, the lived experiences of people are described through their own words and are interpreted as how individuals experience the water issues that affect daily life. The primary data set comprises 77 self-reported "stories" about well-being shared by residents in low-income communities across Cape Town that were drawn from a larger set of 311 stories collected during a study of water issues and residents' coping strategies (Enqvist et al. 2022). Complementing the stories are in-depth semistructured interviews with two key informants working directly in helping communities cope with shocks and stressors, plus document analysis and participatory observation tracing the emergence and development of community-based responses to the COVID-19 lockdown. The investigation focuses on how people directly experience and attach meaning to water-related issues and crises that interact with well-being.

Story analysis
The 77 stories were identified through reanalysis (with permission) of the community network's 2019 data set. We screened the original 311 stories for content about risks to health or well-being, including subjective experiences or emotions related to health and environmental hazards. Drawing from grounded theory (Mills et al. 2006, Charmaz 2020), well-being categories were derived from within the data instead of relying on a theoretical model before analysis. This approach aims to minimize researcher bias by focusing on the stories themselves. Stories were coded by highlighting sections with relevance for at least one category; the coding was then used to group stories into overarching categories of water-related well-being risks and to count the number of stories mentioning each risk. Stories were included if they mentioned a well-being category described through the individual's own descriptions of water issues (e.g., unclean water or sanitation, stress, anxiety, diseases, obstacles to cooking, food gardening). For example, if a story mentioned frustration but not explicitly as causing stress or anxiety, then the story was excluded, even if a well-being risk might be implied.

The story analysis was conducted in a two-step process. First, the first author, in collaboration with another researcher on the same project (Foggitt 2021), focused on direct threats to health and well-being. Second, the first and second author repeated the process, broadening the scope to include indirect threats to well-being, inspired by the distinction used by Lamond et al. (2012). Direct threats are considered as having a clear link between risk and health outcome, e.g., a lack of adequate water causing a direct threat to hygiene practices or contaminated water causing skin infections. Indirect threats to health have more than one causal step between risk and outcome, e.g., water cut-offs impeding cooking and gardening, which undermines food security and

psychological well-being. Both categories of health risks were subdivided into themes that emerged from the within the story data (the types of risks that people mentioned).

Key informant interviews and participatory observation
To complement the SenseMaker stories about water and well-being, we collected additional data in March–July 2020 to explore how the arrival of the COVID-19 virus in South Africa would further affect well-being. We interviewed two key informants with direct insight into local communities' impacts from and responses to the emerging pandemic. Both informants were previous Western Cape Water Caucus members who participated in collecting stories and are currently involved in other community work. One informant works as a trauma counsellor in an area that includes low-income neighborhoods and informal settlements; their professional knowledge and experience as a water activist and teacher provide valuable perspectives on how water-related challenges affect residents' social and psychological well-being. The other informant is a community activist engaged in urban gardening, soup kitchens, and food parcel deliveries during the pandemic lockdown when many lost their regular income; their engagement in community-organized responses to the COVID-19 crisis offered insight into the breadth of challenges people face and ways of coping with crisis. Both informants live and work in the communities that were part of the SenseMaker study, making their perspectives especially valuable and relevant for a broadened and more contextualized understanding of the issues described in the stories.

The trauma counsellor was interviewed in person, just prior to South Africa's lockdown (implemented on 27 March 2020), and the community activist via telephone during the "Level 5" phase of the lockdown, which included a strict curfew for all nonessential activities. Interviews were semistructured and conducted jointly by the first author and another researcher (Foggitt 2021). Responses were transcribed, then coded into keywords and themes based on three main considerations: themes identified from the initial story analysis, water-related challenges that informants considered most pressing to discuss, and the extent to which these responses could speak to aspects of well-being identified in the SenseMaker story analysis. Interview responses were thus used to create a deeper understanding of the stories and their significance in terms of the multiple risks to well-being caused by the water crisis, COVID-19, and the lockdown.

The hardships of the early lockdown made additional interviews impossible because many communities struggled to survive as income opportunities vanished and food insecurity worsened, not least in informal settlements (Battersby 2020). We instead focused on tracking community-based actions that emerged in response to the crisis by monitoring social media communication and, once lockdown levels allowed, participatory observation of on-the-ground relief initiatives. This latter activity included distributing pooled farm produce to members of the local community and involvement in a local community action network (CAN) group in the Vrygrond/Capricorn settlement. CAN groups are formed by community residents in response to crises; in the Vrygrond case, the group focused on mitigating food insecurity related to the lockdown's effect on the informal economy. It mobilized using social media and existing contacts between an urban farmer with land in the Philippi Horticultural Area, residents in Observatory

(a middle-class neighborhood), and a community in Vrygrond, an informal settlement. As a member of the community group, the first author conducted participatory observations while helping with the initiative but chose not to conduct interviews or additional data collection to minimize additional risk of COVID-19 exposure among the already vulnerable residents or the volunteers on which they depended.
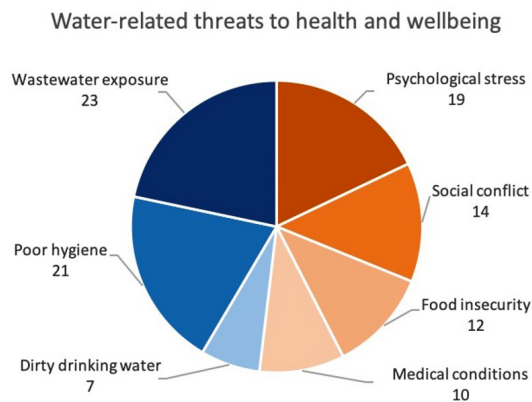
RESULTS

Water-related threats to well-being

> Water issues are central. We use it [water] in culture, in religious purposes, for leisure, for family gatherings—we use it every day. So how do you disconnect life from water? We can't. Water is vital, a fast-disappearing commodity —freely given, but badly managed. Trauma counsellor (KII 1).

The stories extracted from the SenseMaker data set reveal a range of water-related threats to health and well-being in the studied areas. We use seven categories to analyze the ways in which water is entwined with people's daily lives, both directly and indirectly (Fig. 2). We also provide an overview of the threats along with example stories to relay respondents' perspectives directly (Table 1). Below, we reflect on these findings with added insights from the key informants.

Fig. 2. The 77 stories described both direct (blue) and indirect (orange) threats to health and well-being. Several stories described more than one threat, making the sum of numbers exceed the number of stories.

Water-related threats to health and wellbeing

The direct threats described in stories are often a result of faulty municipal or household infrastructure, leaving personal safety to a matter of individual capability and awareness. Many stories mention children as being particularly at risk.

> Currently where I'm residing, they constantly cut off our water, and it has caused multiple problems such as unsanitary conditions. We needed to ask family members for water. We are [many who live] in the house, including children who are constantly sick because of the water problems. Woman, 30–49 years old [area unknown/not indicated] (Story 28).

This problem is also echoed in the trauma counsellor's report from visiting one neighborhood: "There is raw sewage on the streets,

and in the night, I saw kids swimming in the sewage water—raw sewage water."

Although indirect threats are often not as immediately obvious, our analysis found them to be as prevalent as direct threats (Fig. 2). This prevalence makes them particularly important to highlight and examine. Many of the issues relating to psychological stress and social conflict stem from the frustration caused by long-standing unresolved water problems, previously reported by Enqvist et al. (2022), most commonly relating to incorrect or unpayable water bills.

> My problem is my WMD [water management device] and the billing. I went to the City for help, but until now no feedback. I'm so stressed out; I don't know what to do. Woman, 30–49 years old, Mitchells Plain (Story 115).

This frustration surrounding water challenges indicates that community well-being is suffering, be it in the form of individual exasperation and depression, suspicion and disputes between neighbors, or further reduced trust in the abilities and intentions of public agencies. Although some indirect risks are not immediately apparent, they are no less serious for well-being than direct ones. Several intersect with and exacerbate other problems that plague South African society, including gender-based violence, food insecurity, overcrowded homes and settlements, and chronic illnesses requiring long-term homecare. For example, water challenges interfere with daily routines that are essential for well-being.

> I struggled to get water as I had to get it from neighbors with a bucket for cooking, fetch more for washing, and I had to reuse it to clean the toilet and the house. Woman, < 18 years old, Makhaza (Story 14).

Interactions between direct and indirect threats

The SenseMaker stories reveal several examples of how water issues create more than one type of threat to health and well-being, such as poor hygiene and stress from unfixed leaks (story 89 above), wastewater exposure and social conflict (story 281), or difficult choices between household cleanliness or food preparation (story 138). Another example was mentioned by the trauma counsellor, reflecting on the risk of aerial contamination of food in streets and markets from nearby contaminated water.

> There is normally raw sewage water flowing in front of businesses. Some people are selling food—fresh food. So, they are worried. You don't see the dangers of sewage droplets in the air. Mostly the food is [out in the] open. (KII 1).

These connections between direct and indirect health threats illustrate that the multitude of uses water has in daily life not only creates a multitude of vulnerabilities, but also entangles them. Disruption in safe access to water can gradually erode people's capacity to provide and maintain health and well-being, not only for themselves but also for other members of their household.

> We have children, [and we need to do] cooking, washing, and drinking—it's better to not have electricity than water. It is very important, it's our life. You can go without eating the whole day, only drinking water, and you will survive. So now we are facing a serious problem because there are many people staying in my yard so now we can't

Table 1. Overview of the direct and indirect water-related threats to well-being, with example stories to relay respondents' perspectives directly. Story numbers from the original study are included for reference.

Threat	Description	Example stories
Wastewater exposure (direct)	Contact with water contaminated by sewage or pollution. Often caused by absence of effective, functioning drainage systems	*Water is leaking a lot in my yard, and it has turned to green color, which worries me. Now children who play with this water are affected and get wounds and diarrhoea because they drink it.* Woman, 30–49 years old, Du Noon (Story 50) *My house and that of my neighbors (on both sides) are affected by flowing sewage. It floods our yards. The manhole is situated on an incline in the road, and so the sewage comes "downhill" to our houses and there's no storm drain at all to divert it.* Woman, 50–69 years old, Du Noon (Story 5)
Poor hygiene (direct)	Lack of water for bathing, cleaning, and washing dishes and clothes. For some, exacerbated by water restrictions during the drought	*I am struggling [for several] years with a leaking [water management] device on my yard. [The allocated 350 L of water] finishes even before 12 pm—then you have to wait for another day to drink water. It's hard even to do the washing, and the children have no water to wash their bodies. I have to wake up early in the morning to hunt for water in the community.* Woman, 50–69 years old, Du Noon (Story 89) *It was said that we should use water wisely, but how do you prevent getting sick if there is no more water left to clean?* Woman, 50–69 years old, Mitchells Plain (Story 54)
Dirty drinking water (direct)	Poor quality of water meant for drinking, often linked to water cut-offs	*Saturdays: water is off from 10 am 'till 6 pm, and when it comes back it is dirty. This has been happening since June, and people got sick in as much that now people buy water instead.* Man, 18–29 years old, Nyanga (Story 159) *I never used to see brown water in this area or community [when I grew up]. But now we are drinking brown water. Children get sick from this water, and sometimes we don't get water at all, for the whole weekend.* Man, 30–49 years old, Green Park (Story 95)
Psychological stress (indirect)	Frustration, anxiety, and sense of helplessness due to unresolved problems	*I don't have words to express my anger. I'm a single parent of four living on just child support. I'm faced with huge water bills even though I have a water device. Sometimes we have no water for two days. The City sends us around [between different offices] if we go to complain. What can we do?* Woman, 30–49 years old, Mitchells Plain (Story 179) *No way to explain how I feel. No one can help. Our water bills come out very high, and the City threatens to disconnect our water [if we don't pay].* Woman, 30–49 years old, Mitchells Plain (Story 16)
Social conflicts (indirect)	Disputes, tensions, and reduced community cohesion due to conflict over access to water, irresponsible behavior, or violence at shared facilities	*My electricity and water bill are indescribably high; I suspect my neighbors are using my water.* Woman, 30–49 years old, Manenberg (Story 52) *There is a crisis in the community I live in. [...] Community members throw all sort of things, like dirty disposables nappies, tissue papers, dirty papers, etc., causing sewer drains to be blocked [so that the wastewater] goes into the streets.* Man, 50–69 years old, Gugulethu (Story 281) *I don't have [a toilet], I depend on a communal one. This is dangerous at night as one can be raped.* Woman, 50–69 years old, Site C (Story 277)
Food insecurity (indirect)	Domestic gardening schemes or food preparation threatened by inadequate access to clean water	*Due to water issues we could not grow and produce healthy veg.* Woman, 30–49 years old, Mitchells Plain (Story 232) *How can I have a normal lifestyle when we bath, do washing, and by the time I want to make food and wash the dishes, all the water is used up?* Woman, 30–49 years old, Mitchells Plain (Story 138)
Medical conditions (indirect)	Preexisting health conditions can be difficult to care for without water and can impede access to communal facilities	*I have a sick husband who needs to take his medication, but sometimes during the day there's no water until the next morning. Sometimes we sit without water for days, but our bill comes high. Where can we go for help?* Woman, 50–69 years old, Mitchells Plain (Story 294) *I suffer from arthritis, diabetes, and other diseases. I do not have the energy to carry heavy items. I struggle because the water point is a bit far from me [but according to] the law there is nothing wrong with the water point.* Woman, 70–89 years old, Green Park (Story 233)

get enough water. Some people go to bed without water. This issue affects our lives and is frustrating us a lot. We are with sick and disabled people. Woman, 18–29 years old, Du Noon (Story 4).

Community responses during the COVID-19 crisis

Health and water, they are cousins [...] You must at least wash your hands for twenty seconds, properly. If there is no water, it is difficult. Trauma counsellor (KII 1).

A national state of disaster was declared in South Africa on 15 March 2020 in response to COVID-19, followed by preparation within the healthcare system for a rapid rise in cases (Nkengasong and Mankoula 2020). In Cape Town, the pandemic and the lockdown implemented on 27 March came to highlight many preexisting water-related challenges, especially those highlighted by the trauma counsellor a mere three weeks earlier when reflecting on the situation in densely populated informal settlements. More broadly, the lockdown's impacts to the informal job sector also resulted in threats to people's well-being and opportunities for adapting to the crisis. The interviewed community activist described seeing many households struggle to provide food and other essentials because of lost incomes from informal employment, which made dealing with the pandemic even more challenging.

It [the lockdown] has had a huge impact on food security as well as existing social issues. There are top-up grants that facilitate that you will have an extra 300 or so rand. But if I sit with the issue of not having water, how do I

acquire water? I need to go buy it at the shop, the supermarket, and the amount of money that I have is already so limited, I cannot do anything extra with it. So now I have to buy water. Most of these people are unemployed. So being unemployed, being locked down, it has created so much mental unwellness already. It has impacted [people] to the effect that we're sitting with so many social issues that we have dealt with from the beginning, but now COVID has exacerbated this as well. (KII 2).

Here, we shift our focus from vulnerabilities identified through subjective perspectives on water and well-being to some key lessons from Cape Town's early pandemic response gleaned from the community networks assisting residents coping with its impacts. Such assistance focused on finding solutions to provide food, water, and other essential supplies during the lockdown, and perspectives from these initiatives highlight the knowledge and networks that are embedded within communities (Sanchez Betancourt and Teagle 2020, Loewenson et al. 2021). Some initiatives were highly informal, emerging locally as residents identified households in need of support and the ways that challenges varied between communities. CANs emerged in both rural and urban contexts; however, neighborhoods within the city promptly formed networks that became vital to the pandemic response in Cape Town. For example, the small CAN that the first author observed participatorialy demonstrated how these networks emerged locally to fit the challenges of a particular community. This particular CAN emerged from connections established between a community in Vrygrond settlement, a local farmer, and others from neighborhoods such as Observatory. For example, the group began when a resident of Vrygrond reached out to her contacts in Observatory neighborhood for assistance with organizing a community network. The group together organized donations and pooled fruits and vegetables sourced from farmland in the Philippi Horticultural Area, which they combined with supplies from local shops and markets of dry foods such as maize meal and beans. Members of the community network distributed these food donations to the households that needed assistance in the Vrygrond settlement. Vrygrond residents' own perspectives of the dynamics within their area of the settlement provided the essential knowledge of community members in need of assistance in addition to strategies for how they could effectively distribute these food donations among their neighbors.

Some such grassroots initiatives grew to become more organized, often in the form of neighborhood-wide CANs. Critical to these responses was the ability to coordinate and mobilize via messaging platforms such as WhatsApp groups and social media. Two examples are the Muizenberg and Vrygrond CANs, which emerged out of existing personal connections and knowledge of households and neighborhoods in need of assistance (Sanchez Betancourt and Teagle 2020). These groups provided a way to source and pool resources collectively despite the lockdown restrictions, which included a complete curfew for all nonessential activities. The community activist described these types of groups as a tremendous resource during the early stages of the COVID-19 crisis response.

The [nongovernmental organizations] and the organizations are superbly coming together. Like the CAN groups—we have this page where we post and say, "Hey look here in Khayelitsha, we have 20 families that haven't had a decent meal for two weeks. What can be done?" This is how we support each other, to make it a lesser burden on our communities or the vulnerable people out there with no resources available. (KII 2).

As more CAN groups emerged and started collaborating, Cape Town Together functioned as a central platform for connecting people and identifying where help was needed, which the community activist who was involved with this group noted. The initiative was started by a group of volunteers and grew as neighborhood CANs used the network to reach out for support. Two main features of CANs are their diversity and flexibility in both size and function. As the community activist noted, some CANs started as soup kitchens, others donated food parcels and essential supplies or started food gardens within their communities. Thus, CANs functioned to fit the specific contexts and needs of various areas by identifying community perspectives of how and where help was needed. As pairs of CANs linked up, connecting affluent neighborhoods with vulnerable ones, activists at the distribution side of the support chain were able to draw on their knowledge and experiences from living in marginalized areas to identify quickly the people most in need and to help direct support toward individuals and groups facing challenges. The community activist explained:

These feeding schemes that have started, and the soup kitchens... Initially, they have started off with, "I want to feed the kids, you know? Nobody defends them because there is no money". Then I saw, the need has grown—to the frail, the aged, the people with disabilities or disadvantages, that cannot go out and do what they normally would have done. So now the feeding scheme has gone from maybe 100 people to 400 or 500 people at a time. For most of them, it is the only meal or food they will have for the day. (KII 2).

Another response to the lockdown came in the form of urban gardening initiatives to promote food supply within the limits of small neighborhood spaces. For the community activist, urban gardening is linked to both food and water insecurity within communities.

I'm busy doing a program where I encourage every community member that I can find to have a place of two square-meters to grow a vegetable garden. I'm trying to lessen the water usage, the municipal water, so I'm encouraging ways to let the soil [retain moisture, using] wood, paper, and everything that creates this density where water is to be consumed for plants to grow. So, you're saving on water, and you're going out and giving people a sustainable vegetable garden. (KII 2).

These examples illustrate how continuously engaged community activists are able to build up knowledge about multiple overlapping crises. This perspective helps them focus energy on more holistic solutions, rather than tackling one problem at a time with approaches that risk undermining other parallel goals.

However, the pandemic and drought were also different in nature because the severity of the former was clear within weeks or even days, whereas the latter took months and years. The community activist noticed a stronger and more concerted community response to the latter.

> *We didn't see the great response like we see with COVID now when we saw Day Zero. Because Day Zero was [different: you get] one political group, and then you get the other political group. It's more profits before people —that is what we saw with the Day Zero. But with the lockdown and COVID-19, everybody just came together because the government could not or would not supply the needs of the people. The [nongovernmental organizations] stepped in, and the response was so great.* (KII 2).

DISCUSSION
By focusing on people's subjective experience of water challenges and well-being, we examine the interplay between dimensions of chronic water-related stressors and the sudden shock of a pandemic and show how residents are able to self-organize responses to emergencies and support community well-being. In Cape Town, the pandemic has exposed and magnified preexisting threats to people's well-being and urban resilience related to unresolved water issues that have technical, economic, nutritional, psychological, and other dimensions. Such subjective aspects can complement preexisting data on the physical strain of water stress that affects community well-being and climate adaptation. For example, challenges with flood management persist as informal settlements face increasing storms without the necessary infrastructure such as stormwater drains and other services to combat weather extremes (Fox et al. 2022). These challenges become more severe in a context where 8.8% of Capetonians still do not have access to basic sanitation, and those who do have access experience challenges with the delivery of these services (Statistics South Africa, City of Cape Town, living conditions: https://www.statssa.gov.za/?page_id=1021&id=city-of-cape-town-municipality). For people still waiting to get full protection from COVID-19 vaccines or who risk exposure to new, vaccine-resistant variants (Karim and Karim 2021), personal hygiene and clean living spaces are central to minimizing the spread of the virus. Vaccine rollout is often slowest in low- and middle-income countries, where as many as two out of three households are already constrained in these efforts by various water-related challenges (Stoler et al. 2021).

We emphasize the exploratory nature of our study and demonstrate how people's perspectives can provide useful insights for understanding the nuanced nature of risk. This approach highlights the need for careful attention to context when aiming to safeguard human–environment well-being as an integrated process that is important for resilience. For example, our findings help respond to the biocultural framework presented earlier, which calls for "examining interactions between physical (e.g., climate, water), biological (e.g., food, infectious disease), and sociocultural (e.g., economic status, gender, or ethnicity) phenomena to understand variation in human health, biocultural studies thus require in-depth knowledge of the local context" (Brewis et al. 2020:4). We highlight such interactions below through the water and well-being connection, community

responses to biological and sociocultural crises, and the overall value of subjectivity in elucidating the complexity of human–environment challenges.

Water and well-being: entangled problems and unequally distributed vulnerability
Large-scale assessments of access to water services can be blunt tools for capturing the complexity of challenges on the ground (Zawahri et al. 2011). Easily quantifiable indicators for drinking water accessibility, quality, price, and disease risk therefore need to be complemented with measures of more subtle, indirect pathways between water and well-being (Adams et al. 2020). For example, simply measuring water quality and distance to water taps can overlook factors such as unpredictable cut-offs and risk of violence near communal taps. In the water stories extracted from the SenseMaker data set, indirect threats to health and well-being, such as psychological stress and social conflicts, occurred as often as more direct threats such as exposure to wastewater and poor hygiene. Indirect impacts are intangible and hard to measure objectively, and our study also shows that they often interact with direct water stressors and broader household resilience, for instance, when psychological stress over unpaid bills impede a person's capacity to fix leaks or maintain household hygiene. This entanglement shows that seeking solutions only to technical water problems such as poor drainage, leaking pipes, and blocked sewers thus risks leaving larger problem clusters unresolved. A similar connection has been observed in the "embodiment" of water-related issues such as those experienced in the valley community of La Purificación, Mexico, where suffering and health risks are linked to inadequate water access for daily needs (Ennis-McMillan 2001). However, this problem is particularly problematic in South Africa, where the relationship between communities and service-providing municipalities is often already mired by mistrust and frustrations (Goldin 2010, Enqvist and Ziervogel 2019). When such social contracts are lost, marginalized residents are less likely to hold authorities accountable and more likely to resort to informal or even illegal alternatives to resolve problems (Eakin et al. 2019, Enqvist et al. 2022).

Indirect threats to well-being are not only psychosocial, but sometimes more tangible. The story analysis reveals how unpredictable water cut-offs and contaminated water undermine both household-level food production and preparation. People's subjective experience of well-being can help to reveal how the use of and risks associated with water are influenced by local expectations based on gender, class, or age (Das and Safini 2018, Sultana 2018, Maxfield 2020). In Jaipur, India, research in informal settlements has shown how those responsible for collecting water, preparing ingredients, and cooking meals— typically mothers—are most aware of water-related threats to food security (Maxfield 2020). Their roles also entail difficult decisions around reserving water for preparing food or for other household tasks such as washing and bathing. In Cape Town, gendered threats to well-being from water-related issues primarily concerned risk of rape or other forms of violence when relying on communal taps and toilets, especially at night. This situation amplifies South Africa's problem with gender-based violence (Meyiwa et al. 2017) and shows how class and gender intersect to expose an already marginalized group to even greater risk. Such issues cannot be neglected during the response to COVID-19

because evidence shows that these forms of violence rise during pandemics and similar health crises (Mittal and Singh 2020).

Lessons from community responses on supporting well-being as an essential aspect of resilience

Community perspectives are particularly valuable when formal decision-making about crisis responses happens far from the daily realities of an informal settlement, not least when existing stressors already make them rife with internal tensions. When South Africa imposed its COVID-19 lockdown, communities' adaptive capacity was put to the test and could be studied in real time. The observed actions can be viewed as indicators of the emerging threats that residents deemed most urgent and most feasible to address locally. Similar to Cape Town's drought and water restrictions, COVID-19 created not only a direct threat to health (from the virus), but also an indirect one because the lockdown undermined people's well-being by worsening unemployment and food insecurity. The community activist noted that people's responses to both water stressors and the pandemic were shaped by individuals' perceptions of what they viewed as most pressing; these issues risk being overlooked without the embedded, local knowledge of community members. Setting up soup kitchens to relieve immediate needs and supporting vegetable gardens for medium-term food security were, according to the community activist, catalyzed by the threats to health and well-being caused by food and water insecurity.

Community networks such as the CAN groups provided a buffer against the immediate impacts of the pandemic, which would otherwise have been particularly threatening to households in which few can work from home and savings to ride out a lockdown are scarce (Harper and Boatemaa 2020). Beyond the need for daily sustenance, adequate nutrition is particularly relevant to maintain the immune system and for community resilience to the spreading virus (Aman and Masood 2020). Even in contexts of extreme weather events, as opposed to a pandemic, similar foundations for well-being in the form of food security, access to health, and protection from flooding were indicators for how communities in the Niger River basin (western Africa) viewed their own resilience and adaptation priorities (Béné et al. 2011, Food Security Information Network 2014). In the longer term, food sovereignty movements have shown that local food supply can also support social and environmental justice by shifting power to local growers and rethinking how to allocate responsibility and distribution of resources, potentially promoting both social-ecological resilience and equity (Walsh-Dilley et al. 2016). By helping to identify links between vulnerabilities and sources of resilience within communities, the subjective well-being approach could also hold transformative potential. Effective communication to share this new knowledge is critical, for instance, in the community activist's efforts to share information about gardening techniques using greywater. This approach echoes women's agricultural initiatives and home gardens in Sonora, Mexico, where greywater use helps adaptation to climate change; however, such initiatives are often invisible to decision makers and thus struggle to find support despite their potential for promoting social-ecological resilience (Ravera et al. 2016).

Drawing on this importance of community responses for understanding both well-being and resilience, combining perspectives from medical anthropology with resilience and social-ecological systems research could help construct a more holistic view of socio-environmental relations through the lived experiences of communities. These approaches emphasize the social and historical barriers to well-being, in which people's autonomy and quality of life are important variables; this view contrasts with approaches rooted in colonization and epidemiological interventions that risk generalizing communities as "vulnerable" and in need of public health assistance (Ennis-McMillan 2001). For example, a focus on people's well-being can help capture socio-environmental dynamics more holistically because of how "water insecurity manifests in local biologies in ways that reflect broader social and political inequalities" (Brewis et al. 2020:11). Rather than "water insecurity" being strictly a lack of water, social structures such as socioeconomic status and gender can influence water use and the experience of water-related stressors (Brewis et al. 2020). These links are evident in our results: the stories demonstrate the social constraints that influence water service delivery and the types of chronic water and food security stressors that become even more urgent in the context of crisis events.

Subjectivity as a tool to identify and assess threats, and a guide for adaptation

Our findings demonstrate that if well-being is used as an indicator for resilience, it is necessary to engage with the multiple functions of water in its relation to well-being, food security, and climate adaptation. Engaging in subjectivity is therefore crucial for guiding adaptation processes, as water's multifunctionality typically requires collaboration across levels from local to municipal, based on understanding needs of communities without overburdening them with finding all solutions (Enqvist and Ziervogel 2020, Enqvist et al. 2022). The potential for transformative change is therefore determined not only by local stakeholders' abilities and ingenuity, but also by how other actors and structures shape the surrounding opportunity landscape (Westley et al. 2013, Boonstra et al. 2016). Crucially, collaborations need to go beyond extracting local knowledge and to support and to recognize the important work done by grassroots initiatives to strengthen trust between communities and municipalities. Co-designed knowledge creation processes such as SenseMaker can play an important role in voicing residents' lived experiences while also empowering groups like the Western Cape Water Caucus by opening up new opportunities for them to grow as agents of change (Ziervogel et al. 2022). These types of research tools thereby act to "legitimize" both nonacademic partners (as viable partners for municipal collaborations) and the individual stories shared by community members (systematically compiled, analyzed, and presented, drawing on both qualitative and quantitative data) in the eyes of public authorities that still struggle to establish trust. This approach could also improve overall societal resilience in the face of pandemics. Community-driven COVID-19 responses similar to Cape Town's CAN groups have also been documented in places such as Accra, Ghana, demonstrating communities' own capacities (Harper and Boatemaa 2020). In our case, their perspectives helped shed light on how the pandemic exacerbated preexisting intertwined issues of water and food insecurity, which might otherwise have been unclear to city-level adaptation efforts. If these initiatives can help to guide public efforts, they would, in effect, employ subjective perspectives to identify priority risks and

obstacles to coping with crises that can be difficult to capture in conventional crisis management. Such improvements in communication and collaboration would be especially relevant in Cape Town, considering how types of risks and levels of informality can differ among communities.

In summary, subjectivity helps to provide more useful engagements with resilience as something that is sometimes desirable, sometimes not, depending on who you ask. This context dependency makes subjectivity a valuable tool for addressing the "for whom and to what" central to resilience by voicing community perspectives about local challenges and opportunities that influence what urban resilience means in different contexts. The entangled nature of water issues, inequities, and capacity to adapt to crises is demonstrated through subjective stories of people's lived realities. Failing to engage with this complexity, e.g., by relying on vague definitions of "urban resilience" or "urban sustainability" can hinder transformative work (Elmqvist et al. 2019). In this sense, resilience can be desired or undesired because it depends on the context, which means that transdisciplinary research approaches that voice community knowledge and the challenges communities face are critical, especially when it comes to addressing structural inequities and empowering communities as essential to climate adaptation and transformation (Enqvist et al. 2022, Ziervogel et al. 2022). Enhancing knowledge about subjective experiences of well-being and resilience can thereby help to "direct" transformations toward a specific pathway (Elmqvist et al. 2019:270). From the perspective of our study, it thereby becomes crucial to read resilience not as the ability to return to the old ways, but as the collective efforts to transform systemic inequities to address root causes of social-ecological crises (Leach et al. 2018, Meerow et al. 2019).

While subjective perspectives offer advantages, they also risk carrying biases from researchers and community members because of preconceived knowledge and beliefs. Our study is exploratory, tracking an emerging mix of crises, and the insights presented deserve further examination using additional research methods. However, it should be noted that subjective dimensions cannot be entirely controlled for, even in "objective" approaches that seek to eliminate bias in empirical research (Richardson and Polyakova 2012). Instead, research could benefit from even more extensive engagement in subjectivity to understand and acknowledge how subjectivity influences research and efforts to direct positive sustainability transformations.

CONCLUSION

Social-ecological resilience is, among other things, about ensuring human well-being despite shocks and stressors. However, in highly unequal, diverse societies characterized by heterogeneous living conditions, such disturbances are likely to have a range of different effects on well-being. Therefore, resilience-building efforts stand to gain a lot from perspectives that draw on people's subjective experiences of, and responses to, crises such as the Cape Town drought and the COVID-19 pandemic. Here, testimonies from residents' own stories not only highlight both direct and indirect effects on well-being, but also describe how multiple problems can become entangled and are paralyzingly difficult to resolve for someone caught among them. Subjective experiences thereby help in understanding the landscape of vulnerabilities that threaten community health and well-being and local-level resilience.

However, residents' lived experiences are also valuable beyond identifying vulnerabilities because they can play a role in directing transformative processes that seek to address systemic inequities and other causes of social-ecological crises. In Cape Town, community-based organizations took an active role in responding to the early pandemic and strict lockdown, benefiting from their own activists' years of experience and existing networks to identify critical issues that emerged within communities. Therefore, they were able to direct support from those who were able to help to match these efforts with those who most needed it, within a matter of days. Importantly, local residents rarely have the capacity to roll out a sufficiently extensive crisis response on their own, especially considering the chronic problems that many are already struggling to address. However, their embedded knowledge and know-how are critical for prioritization in implementation, especially in contexts defined by high degrees of informality, where top-down approaches relying on assumptions of functioning public services have little relevance. In such contexts, better communication and collaboration between actors in low-income areas and the municipal government could make the allocation of necessary resources and assistance more effective. In other words, the viewpoints of local residents are important for developing a shared understanding of what resilience means for a community, society, and levels of government (Stedman 2016). Our study demonstrates that this subjectivity approach to community well-being is relevant both when responding to the rapidly emerging impacts of a novel crisis such as COVID-19, as well as the chronic stressors left unresolved by conventional approaches to long-standing problems with Cape Town's water management.

Responses to this article can be read online at:
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php/13192

Data Availability:

The data that support the findings of this study are available on request from the corresponding author, KH. The data are not available in a public repository because they contain information that could compromise the privacy of research participants.

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