

## **Intriguing Human-Waste Commons: Praxis of Anticipation in Urban Agroecological Transitions**

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### **Abstract**

In recent years, citizen designers have been working with urban communities on the ecological reuse of human waste. In this commoning effort, practitioners reclaim body-expelled resources for exploring the metabolically enabled household as a networked site of radical, co-productive transitions that harnesses nutrients and boosts local value chains. The commoning of human excrement is understood in the context of agroecological urbanization that seeks to empower urban dwellers to become contributing actors in the food-energy nexus by making the city more food-enabled for storing and proliferating feeds, fertilizer, and food. By introducing three cases of human-waste commons in Brussels, Hong Kong, and Berlin, this study approaches commoning design as a process grounded in the praxis of anticipation. In this way of life, consistent with the anticipatory nature of living systems, the transformative potential in people, their waste, and social arrangements stem from the dynamic continuum of mutual purpose, trust, and vigilance. Collective desire, resolutions, and statuses are a result of direct involvement, context, and relationships. The three examples show how citizen designers draw energy from anticipating regenerative, life-giving value chains around human waste that give momentum to overcome the given thresholds with perseverance and resourcefulness.

### **Keywords**

Value chain design; ecological sanitation; food pedagogies; collectivized resourcefulness; metabolizing infrastructure.

### **Introduction**

Agroecological commoning places urban soil care centrally within urbanization and community development to bring regenerative, biophysical relations into decision-making processes, and move beyond narrow functionalist approaches (Schneider and McMichael 2010). In recent years, some urban designers have been actively developing a public commons through the agroecological use of human excrement. What initially may sound suspect is the sincere attempt of building pragmatic working alliances from human-waste

commons that reconcile, whereas the ecological disconnections of human-nature and producer-consumer become the central concern in food system transformations. Human-waste commons with the inserted hyphen between ‘human’ and ‘waste’ is a reminder that producing “muck” (Worster 2017) is an inextricable part of being human. The question is how to go about remediating this human wastefulness. To meet the vital need of recovering humanly released nutrients that otherwise charge and overburden the environment, human-waste commoners work hard and engage in grassroots experimentation to demonstrate the feasibility of closing material circulations originating in food stocks and expelled from one’s body.<sup>1</sup> Even at their small scale, human-waste commons are radically potent and political because they are about resource access, regulation, and sovereignty.

Increasingly, public sewage filtration plants extract fecal nutrients for agrarian use through very costly, tax-subsidized retrofitted technologies (Etter, Udert, and Gounden 2015). Similarly, pharmaceutical companies are privatizing the biome of human waste for gastroenterological treatment with the blessing of industry-friendly regulations (Bollier 2019). Human-waste commoners must go through the trouble of acquiring tried-and-tested sanitary remediation skills to regain control over what is their own: bodily excreted nutrients and biomes. Excremental commons thus circumvent the enclosures of market order and enforced hygiene regimes to safeguard their free access and affordability.

Before sedentary settlement and agriculture, foraging nomads already understood that when the woods, tundra, or desert reached a surfeit of their bodily wastes, it was time to resettle, escape the polluting waste products, to find new grounds and food sources. While the metabolic exchanges of material and energy in organisms are the “natural chemistry of staying alive” (Worster 2017), the waste products expelled contain inherently pathogens that pose health threats for people and the environment when space and precaution are lacking. Urbanization complicated the conservation and transformation of metabolic pollutants into nutritious wealth. As city populations swell alongside their metabolic demands on eating and excreting, conventional sanitation infrastructure focused on waste elimination that breaks material circulations of water/nutrients/carbon, thus depleting instead of replenishing the biophysical foundation of life (Waltner-Toews 2013). Until recently, sanitation research was focused on pathogen removal and avoidance of human health risks.

In contrast, applied research that emphasizes agricultural reuse aspects have been side-lined (cf. Carr, Blumenthal, and Mara 2004). With a multitude of contextual factors influencing the reuse options for humanwaste, one-size-fits-all solutions are not viable. In response, there is a call for reconsidering sanitation through the discipline of agroecology

(Weckenbrock and Alabaster 2015) that offers a range of value-based methods for explicitly addressing the social, cultural, and environmental integration of human waste.

### **1. Radical Agroecological Transitions and Design Commons**

Agroecology conjoins participatory and culturally sensitive progression toward non-extractive, resource-conserving access to food, energy, and self-efficacy that define it simultaneously as a scientific, practical, and political tool (Tornaghi and Hoekstra 2017). It is rooted in non-hierarchical social learning frameworks that shape the way humanity's biophysical foundation is replicated and socialized across communities and generations. Inside the vision of agroecological transitions, human waste becomes a matter of combined hygienization, irrigation, and fertilization strategy that links environmental and health protection with food and energy production while developing entrepreneurial opportunities (Mateo-Sagasta et al. 2013).

Reintegrating human waste and commoning of urban resources is not just about replenishing soil ecologies. In part, it permits communities to regain control over their social reproduction. It implies that composting, soil care and food cultivation are recognized as essential, biopolitical relations that substantiate people, society, and economies (Gidwani and Ramamurthy 2018; Katz 2001). The agroecological tradition originates from South American peasants' constant struggle for regaining food sovereignty over dominant forces of colonized or 'civilized' life (Altieri and Toledo 2011) that entails soil degradation, food deserts, land speculation, exhausted populations, and squandered resources. The interlinking of southern agroecological methodology with the northern concept of commoning in food systems can spur collective practices where natural resources and human behaviors can be co-constructed, co-valued, and co-regulated in locally appropriate arrangements that overcome incremental reformist attitudes in consumerist societies (Ferrando et al. 2020).

Agroecological transitions require radical pathways for shifting the current logics behind short-term growth and risk aversion toward long-term "thrivability" (Russell 2013) in urban metabolic and social ecologies. Agrarians established the Foodsystem Transformation Taxonomy (Holt-Giménez and Shattuck 2011) to understand how agroecological transitions can retain their integrity and change potential. It differentiates reformist/aid-oriented, progressive/empowerment-seeking, and radical/redistribution-enabling approaches. Radical/redistributive here means not only creating isolated alternatives or supporting agroecological farmers but also systematically dismantling the self-perpetuating processes and disempowering arrangements of current urbanization (Tornaghi and Dehaene 2020).

Agroecological transitions understood as commoning of urban nutrient systems propose a pragmatic praxis of knowing, doing, eating, eliminating, and being beyond the current conditions of the market and the state. Reproductive social practices intertwine the shared domains of domesticity, associations, and environment, thus moving beyond dualistic conceptions of subjectivities like public/private (Sohn, Kousoulas, and Bruyns 2015) or consumer/producer. Current design discourse points to a monistic individuality where selfhood is continuous, adaptable, and coterminous (Braidotti and Vermeulen 2014). This insight stems from the realization that the capitalist order is flexible and unbreakable. Radical change does not materialize from awaiting a distant, otherworldly future but from the interior reorientation of subjectivity (Bendell 2018). If commoning is indeed an action concept for social learning or pragmatic working alliances (Linebaugh 2008, p. 279) – rather than “abstract, compulsive repair” (Berlant 2016) – it will involve “transformational infrastructures of attention and aversion” within the messy ambivalence of an ecologically situated, social life (Braidotti and Vermeulen 2014).

Parting from a fading era based on specific state and market definitions of what it entails to be a citizen, consumer, or participant, commons activists are demanding a new vocabulary that can yield social paradigms of caring, exchanging, and collectivizing (Bollier and Helfrich 2019). Participatory design researchers are also arguing that such concepts need to better account for sharing practices that may challenge or stretch the notion of the commons if they want to promote pluralistic, intercultural perspectives in design (Botero et al. 2020). Moreover, design commons are challenged to better account for shared frailty and bodily relations in a world of exchanged resources and mutual interdependence of material cycles (Savazoni and Andrade 2019; Escobar 2018a).

Design commons that seriously aim at empowering communities to become agents in circulations of the food/energy nexus need to devise new strategies that are not resigned to merely imagining utopian agroecological futures. Instead, they involve stakeholders in a rich constellation of wholesome practices, pervasive and engaging enough to disrupt prevalent arrangements and bring about change (Dehaene, Tornaghi and Sage 2016). If local, home-cooked food is to replace industrial readymade meals, if recovered nutrients instead of finite petrochemicals are to nourish the land, if adept producers are to emerge from inept consumers, then making and taking *time* is imperative. Thus, social arrangements need to be in place, and situated knowledge reproduced that makes dedicating time *worthwhile*. Design research describes this transition process as the “infrastructuring of everyday life” (Karasti 2014; Marttila, Botero, and Saad-Sulonen 2014). If engaging with human waste is more than

an activist stance, it demands a healthy dose of humility, acumen, and social support. In response, this chapter seeks to understand better the dynamics underlying community formation and sustainment in alternative resource systems. It also seeks to contribute to heuristics and terminology in design commons that account for the visceral materiality and temporality evident to agroecological transitions.

In assessing their transformational potential, this research considers human-waste commons that (i) revere the ecological use-value of soils and organic residues for land and food cultivation; (ii) partner with natural forces, microbes, insects, and plants to render visible the ecological separation in urban life; (iii) link citizen-led collaborative arrangements with resource sovereignty; and (iv) challenge previous decisions and path dependencies that have been “hardwired in the ‘food-disabling’ city” (Tornaghi 2017) to enact inventive social arrangements, cultural practices and public infrastructures that endorse and reward agroecological resourcefulness and food growing.

This research looks at human-waste commoning examples in three cities: Brussels, Hong Kong and Berlin. They were selected because of their socio-cultural diversity and focal complementarity as they represent varied cultural-political-economic contexts and contrasting population densities. Deliberately these examples are all situated in the global North and run counter to the prevailing assumption that predicate efforts in alternative human-waste management are exclusive to informal and indigenous settlements of the global South.

In order to respect local and traditional knowledge, this research adopts the participatory action research method (Heron and Reason 2001), constituted from social platforms that include placemaking events, urban living labs and social enterprises specific to each example. Each platform convenes actors from distinct domains for staging pre-design studies, workshop series, agroecological practices and in-depth conversations that shape strategies and active implementation plans. Consequently, this chapter synthesizes exchanges with facilitators and analyzes content from participants’ responses, project presentations, and media coverage, areas of similarity, contrast, and mutual learning of these projects. Grounded in day-to-day experimentation within the fluid, contradictory social arrangements, and with disparate expertise engaged, the examples productively navigate the tension between what-is-now and what-is-possible-tomorrow, for testing of place-based alternatives (Siltanen, Klodawsky and Andrew 2015; Harcourt and Escobar 2002). By acknowledging resourceful interdependence as a ‘distributed problem’ to be addressed within everyday life, the examples

avoid playing citizens against regulatory authorities by situating their efficacy-seeking practices squarely inside sanctioned communities and places.

The human-waste commons provides a practical context for mobilizing diverse actors on different scales. Beyond articulating debates around urban nutrient sinks, localized food systems, co-evolutionary health, and land access, it outlines possible changes in economic values, spatial relations, and collective improvisation. As described in the following sections, the examples illustrate constructive disruptions to the deep-seated unsustainability of current urbanism. Abandoning normative positions and conceiving urban resourcefulness as a way of life and praxis, the examples seek personal and social accountability for the regeneration of the biophysical foundation, knowledge, and skillset required for long-term thriving (Wernli 2020).

## **2. Examples of Human-Waste Commons in Brussels, Hong Kong and Berlin**

Through thoughtful content review and practitioner exchange, this section illustrates the assets, ambitions, collective practices and value systems impelling the human-waste commons as opposed to the compelling determinism of industrial waste infrastructure. Each example in their local setting explores alternative social configurations toward radical agroecological trajectories (Tornaghi 2017). In the latter sections, the author deduces the primary transformative dynamics across the examples and discusses how they relate to debate and furthering the design of the commons.

**Brussels** shows an agroecology movement that is fragmented alongside language and regional divisions (fig. 3.1.1). Recent local food and climate-sensitive regulations support urban community growers and market gardeners who cultivate interstitial areas in the dense city. This policy context also spurs young entrepreneurship in the agricultural reintegration of by-products from the brewery and food industry. The action-research here gravitates around a cohort of architects, artists, and citizen-designers that go by the name of Collective Disaster (Amaya 2016). Initially, the group formed in response to a call in 2014 by the Belgian Ministry of Environment to revitalize a derelict downtown park. In the ensuing collaboration with neighbors and authorities, over the summer of 2015 Collective Disaster realized a community-run, ecological public toilet facility (fig. 3.1.1). The resourceful place-making activation became known as *L'Usine du Trésor Noir* ('The Temple of Holy Shit'). To overcome resentment and gain social support, the collective involved neighbors in planning, building, and operating facilities that incorporated spacious, urine-separating toilets and designed a nutrients-processing system for renewably-powered hot tubs.

The collective conceived the pyramid-like structure to make the fermentation stages from waste to soil into an enjoyable, social experience. The toilet units were operated over six months and integrated on top of an elevated platform with arena-like stair access. On the back side, the toilets could be exited on two slides while the front stairs served as a public stage. The basement below the toilet structure housed the sealed collection barrels that separated urine from solids to process them onsite with microbially activated charcoal dust (biochar). Using Terra Preta Sanitation, the combined fermentation/compost process eliminates pathogens, stores nutrients, and upgrades human waste (alongside woody residues) into veritable fertilizer within one year (Andreev et al. 2015; Schmidt 2012).<sup>2</sup> From the collection chamber, narrow-gauge tracks allowed the easy transportation of full collection barrels to the adjoining composting site. The excess heat in the metabolic process was harnessed for operating hot tubs installed above the compost bays. The park-enlivening public toilet has garnered several ecological awards and international acclaim (Karga 2014; Sollazzo et al. 2014). Ever since, Collective Disaster combines the resurrection of organic wastes with the resourcing of novel social constellations through outdoor structures and urban interventions that are materially performative. The collective brings together soil experts, authorities, and local communities to reconceive, at least temporarily, physical and operational infrastructures (for composting, water provision, greenery, and mobility) that cross the divide between pro-environmental resource conservation and social capital at peri-urban scale. The challenge here in commoning human waste is to create strategies and synergies for public tolerance and land access that cut across long-standing inertia and revulsion against life-supporting, microbial partnerships. Pandemic fears can trigger unsubstantiated, adverse reactions towards everything microbial since it is unseen, unknown, and inevitably associated with disease.

**Hong Kong** presents a more dissonant context, where activists and practitioners are resisting rampant, speculative development, concentrated land ownership and food-skill loss by carving out niches for agroecological thinking and acting (fig. 3.1.2). Hong Kong's highly fertile delta region was until the 1970s home to substantial rice and fish cultivation that appreciated human manure inside organized commodity markets to sustain yields (Xue 2005; Shiming 2002). Even today, smallholder farmers in southwestern China employ human waste for private use (Leung 2020). The university-endorsed action-research responded to mounting food safety and environmental health concerns, and that evolved around The Zero Organic Waste Home initiative instigated by the author for engaging the community in a reskilling and practical exploration of agricultural opportunities. A citizen-design initiative coming out

of this urban living lab is the promotion of collective urine upcycling towards cultivation of indoor plants as a means to enable urban residents deprived of balconies and land access (fig. 3.1.2). In the ensuing work alliance, twenty-two households of diverse socio-cultural backgrounds were invited into an ‘urban ecology adventure’ for fermenting their urine to fertilize a substrate to grow edible plants. Thereby they created a simple material relationship between their bodies and the environment. Each fermenting urine specimen became part of an annotated self-examination passage (Meiselman and MacFie 1996) that involved medical dipstick testers, diet monitoring, and plant development tracking. Participants consolidated this into an intricate ‘mutual thriving’ journal. The citizen-design research spearheaded a closed-loop resource system that was untested and required participants to overcome technical and affective ambiguities jointly. The exercise sparked curiosity and a unifying purpose, strengthening social engagement, inventiveness, and environmental connections for over three months. In the context where continued destruction of arable land and leisure-fixated use of green areas are curtailing land access for composters, farmers, and foragers, this human-waste commons shaped and sharpened an ethic of (soil) care for activating practices of personal nutrient sovereignty. The agroecological experimentation reframed human waste as a responsibility-triggering agent. Here more-than-human affinities run counter to visions of the urban as an inevitable nutrient sink, reimagining instead the functioning of agroecological households in closing and embracing their material circulations.

**Berlin** appears in many respects, a contrasting example (fig. 3.1.3). Here the legacy of the centralized, state-owned economy of former East Germany and the fall of the Berlin Wall has contributed to a socio-natural landscape with many undeveloped urban allotments. Thus, many residents have access to food growing, neighborhood composting and urban foraging, in parks or other land. Concurrently, Berlin’s surrounding agrarian region (historically known as Central Europe’s Bread Belt) suffered in recent decades from acute soil degradation, droughts and water shortages that are spurring experimentation in agroecological urban sanitation systems. Within this context, an aspirational, artist-led human-waste reuse program has evolved over the last decade into a communal start-up that pioneers the eco-friendly transformation of baby nappies into fertile soil and fruit orchards (fig. 3.1.3). Building on revenue from tree adoptions, rather than sale of diapers, the DYCLE social enterprise entails custom production of biodegradable diaper inlays and communal composting into Terra Preta black soils (akin to the Brussels example) for cultivating heirloom fruit trees. Participating young families meet weekly at a central processing point



for exchanging soiled inlays with fresh ones (Debatty and Matsuzaka 2019; Reynaert 2016). Beyond biodegradable product, DYCLE creates a complete value chain that enables the local community, soil care, food forests and employment. Each step in this value chain was a matter of iterative testing over six years before the agroecological diaper cycle was fully established and ready to launch. In this instance, commoning is about inviting people into the uncertainties of agroecological circulations by offering them multi-level discovery of reaffirming, environmental interactions. Catering to novelty by stirring curiosity overcame initial aversion towards human waste and stirred latent aspirations for enacting more fulfilling, ecologically contributing lifestyles. Besides, the mindset of generations that grow up with diaper-fertilized orchards helps manifest the interdependence of humans with the earth's shared metabolism. The enterprise helps normalize the reintegration of human waste in agroecological urbanism.

### **3. Findings: Praxis of Anticipation as an Operational Mode for Design Commons**

The three examples of agroecological human waste reuse illustrate practices and struggles that disrupt spatial conditions, cultural validation, economic assumption, and planning processes in the context of Western urbanism. Acting on the level of resourceful toilets, composting cycles and regenerative afforestation, these examples illustrate important principles for enlisting and guiding community development, which can also be relevant for design commons more generally.

The practitioners of the human waste reuse examples find themselves in a dynamic of anticipation that encapsulates three areas, including (i) advance awareness and care, (ii) deconstructing existing worldviews, and (iii) novel programmatic affirmation. Advance care for the human-waste commoner starts with a concern for the suitability of her metabolic waste products for reuse in growing food since modern diets and lifestyles currently compromise ecological use-value. Deconstructing worldviews is inevitable when advance care is put into action, and the human-waste commoner realizes how to shift the public away from short-term, purification-fixated agrarian and sanitation regimes that rely on synthetic inputs and impede long-term soil, human and ecological health; a conundrum that questions the very logics of 'being human' in this world. Programmatic affirmation comes from the mutual realization that the current resource-squandering social arrangements can be confronted while rebuilding resourceful communities, and novel infrastructures can be a delightful prospect.

### 3.1 Advance Care: Embodying More-Than-Human Solidarities

All three examples above go a long way to challenge human selfishness embedded in current social and urban arrangements. The primary concern for human-waste reuse practitioners is always how the nature and quality of their excrement influence the plant life sprouting out of it. When humans recognize they are creatures of the soil alongside metabolizing lactobacilli, mycorrhizae, and earthworms, it stimulates more-than-human alliances and raises possible solidarities (Heynen, Kaika, and Swyngedouw 2005). When the person opts to eat healthier food to produce better quality excrement-to-be-fertilizer, the person then exists to the extent of anticipation, not just participation and reaction. Anticipation from Latin *antecipere* denotes ‘understanding (of harm) beforehand’, what Mihai Nadin (2005) encapsulates as *anticipo ergo sum*: I anticipate, therefore, I exist. Thus, living here is contingent on the “sixth sense” (Nadin 2005) of taking care of matters ahead of time to forestall detriment or decay. In contrast to prediction, which tends to fixate positions and probabilities, anticipation is an ongoing scanning and prefiguring of possibilities that acknowledges uncontrollable dynamics in the biological world. Through anticipation, the actor responds to and integrates with complexity.

In Hong Kong, urine-recycling participants came together to become directly involved in monitoring human and plant health in a self-diagnosing, pedagogical arrangement. In Berlin, diaper-composting families maintain awareness of the inextricable connection between plant prosperity, soil health, and human flourishing with support from soil and tree experts. In Brussels, the functional requirements and underutilized potential of composting energy and its excess heat dictated a social and architectural re-structuring of the public toilet. As a social form, advance care suspends careless consumption and otherdegenerating practices. In all three cities, human-waste commoners recover nutrients through fermentation and mulching, regenerating growing media and committing to native species wealth. These practices disrupt productionist rationales that have depreciated advance care ecologies and social reproduction as ‘unproductive’ (Puig de la Bellacasa 2017, 177). The revival of communal composting, fermentation cohorts and heirloom plantations, as well as personal accounts of traditional resourcefulness practices with human waste – most prominently in the Hong Kong example – also contribute to reshaping eating and excreting behavior in the context of culturally entrenched, socially divergent, politically charged and fragile ecosystems.

The hosting of a public composting toilet in the neighborhood, cultivation of urine ferment in the bathroom, and processing diapers into viable humus for orchards rely on

complex socio-biological timings and precarious grassroots coordination. It highlights the centrality of householding routines in urban toilets, joint compost yards and peri-urban food forests as essential sites of social reproduction and livelihood enablement. Anticipatory commoning thereby moves beyond the institutional workplace and shifts focus to the enlivening opportunities inherent in a collective reorganization of domestic spaces (Hester 2017). If metabolic transformations become the baseline for how society approaches modes of production and destruction, then it lends urgency to increasing the permeability between those two spheres. Placed within the demands and responses of living compost and fermenting cultures, humans reveal themselves as individuals of a species working together with other species; as knowledge-holders drawing from experience or intuition; as problem-causers burdening ecosystems, and as solution-holders grounded in trust and collaboration (Fletcher and Tham 2019, 40).

This opens up temporal spaces of attention, connection, and production. It means that underutilized resources in people and community gain value when shifting from market to affect economies. (Sohn, Kousoulas and Bruyns 2015). It is the adventuring between self and system. In a privatized, time-wasting world, ‘in-betweening’ efforts demand and necessarily raise issues about replenishing and the dangers of exhaustion (Hester 2017). The public eco-toilet commons in Brussels focused on participatory planning and implementation, yet efforts ceased at the end of the project, and the black soil generated remained unused. Similarly, with the urine reuse experiment ending in Hong Kong, only a few participants remained motivated to continue. In contrast, the diaper recycling venture in Berlin incorporated entrepreneurial opportunities and the persistent neediness of the human infant that sustain the human-waste commons over the long arc of generational time.

Human-wastecommons as a co-evolutionary process of cohabitating species contrasts with another approach to reorganizing the social. When predictive computing and “anticipatory algorithms” extract data deemed “useful” from other sources deemed “useless,” then such reality-formation has become an asymmetric economic process (Reed 2017). Therefore, machine intelligence is “sociomorphic” (Pasquinelli 2016) since “sharing economies” or “economies of suggested content” boost a sense of affiliation with like-minded people. Yet these algorithms are devised for and restricted to monetization of notions of friendship, hospitality, domesticity and volunteering (Han 2014). Thus, perhaps the process of commoning human waste can be appreciated as a place to counteract the digital encroachment and enclosure of human living, since such resource systems require and uphold human qualities of individuality, kinesis, anticipation, and deliberation.

### **3.2. Deconstructing Worldviews: Resisting the Logics of Substitution**

Currently, global economies are founded on monetary exchange where the validation of wages for labor and the cost of goods is fixed through mechanisms of markets and policy that often do not account for ecological damage and human equity. Instead, these logics substitute land speculation, unseasonably produced food imported from far afield, and extravagant waste regimes causing nutrients loss, transportation pollution and hunger. All three examples of human-waste commoning prefigure and test practices that break free from such pervasive and harmful wastefulness.

In Brussels and Berlin, a quest for more pastoral use of land and establishing alternative livelihoods as citizens designing ‘grower-eater-digester-fertilizer’ systems have inspired human-waste reintegrating practices that align with the local food movement based on soil-proliferating validation. In Berlin, the diaper-fertilized apple orchards expand to protect the green belt from further real estate development. In Hong Kong, lack of land prompted urine-recyclers to explore suitable rooftops, balconies, and windowsills as sites of planting experiments. In all three examples, human-waste commoners realized and demonstrated how agroecological use of excess nutrients is ignored in the speculative real estate market driven merely by rents and mortgages. Agroecological commons denote the foundational dependence of humans on soil for provisioning of food and resources as a vital concern and political contention (Tornaghi and Dehaene 2020, 605). Thus, it opposes submitting to soil-less types of urban agriculture, indoor warehouse growing, vertical farming, or aquaponics. By substituting the natural ecologies of soil with costly, energy-intensive and wasteful infrastructures that rely on synthetic nutrient formulae and extractive mining, they cement the dominant, financially speculative market logics rather than providing protection of land and resources (Trejo-Téllez and Gómez-Merino 2012).

This contention became particularly prevalent in Hong Kong, where due to land-deprivation, the citizen-research initially tried to apply the upcycled urine to a water-based growing method. As participants had to learn the hard way, this soil-less system lacked the necessary microbiological and respiratory functions to convert the human-derived nutrients into legitimate plant fertilizer. The urine commoners eventually replaced hydroponic water with coir, a fiber by-product of coconut shells, and thus able to mimic the resource-metabolizing, transformational powers of the soil.

Currently, the unhealthy substitution of quick profits for soil depletion and maximized returns of a privileged few for equitable work conditions seem to prevail. For deconstructing

(and overriding) these imbalances design commons are is tasked to lead transitions (agroecological and otherwise) toward alternative value proposition (Escobar 2018b).s (Lane 2011). It seeks to socially enact practices that anticipate and stipulate non-extractive forms of urbanism. Feminist philosopher Rosi Braidotti indicates how navigating, let alone manipulating, the self-perpetuating, hegemonic conventions of capitalist urbanism requires guidance through “fight[ing] inertia with creativity, negativity with affirmation (Braidotti and Vermeulen 2014, 188).” All three human-waste commons seek renewal across life forms as a radical answer to the general abandonment of human nutrients, brownfields and self-efficacy. Since human waste tends to be unfit for field crops, designers needed to propose and demonstrate alternative, advantageous applications such as jacuzzi heating, interspecies health monitoring, or intergenerational afforestation. In anticipation of such regenerative purposes, dry-toilet patrons, urine-recyclers, and diaper-composters became part of a living constellation and stratified sensemaking where subjects are multiple and ever-becoming, therefore always in flux. Braidotti (Braidotti and Vermeulen 2014) also emphasizes how only such processual, multiple personalities will be able to pervert and overturn the current substitution logics.

Philosopher John Dewey (1938, 69) already acknowledged how moving from inertia to affirmation is the result of anticipation coupled with joint desire; the discernment of consequences blending with a purpose that then “gives direction to what otherwise is blind.” In the three examples, the pairing of the direct experience of human-waste reuse with the reflection thereof through feedback sessions, a journaling routine, and teamwork builds subjectivities based on negotiating and mediating the thresholds of shared living. Consequently, the ethical orientation of the subject is shaped by the influence of the power of the subject’s actions on the environment rather than external impositions (Dolphijn and Tuin 2012, 35–36). This fluctuation of deliberate and repressive power potentials increases the subject’s capacity to enter into multiple, nuanced relational “intimacies and associations that make life sticky and interesting for it,” as cultural anthropologist Lauren Berlant (2016) notes.

In the social learning proposed by the three examples, citizen-designers opened up wicked problems with multiple others searching for viable responses instead of trying to solve them in preconceived and homogenized ways (Carolan 2017, 173). In this “researchful” power potential, the facilitators or instigators (“experts”) learn about the challenges from and alongside participants, household members, and neighbors (“students”). Bringing urban dwellers into action-research and exposing scientists to the messiness of the field is key to

unbinding scientific development, generating yet unexploited knowledge, and tapping into previously unimagined relational agency (Sciannamblo, Lyle and Teli 2018). Thus commoning practices become the substantiation of differentiated networks and practices where attending to shared metabolism is the membership in what food sociologist Melanie DuPuis (2015) calls “the world of eaters.” The commoners in the three examples exchanged the logics of substitution (alongside unhealthy inertia) with the “digestive paradigm” that recognizes the vitality of materials, the importance of nature’s nonhuman actors, and the need for contingent socio-natural alliances to redevelop potentials, reservoirs, buffers, and resources. In human-waste commons, subjects sanitize their excrement by way of positive, microbiotic colonization. This anticipatory process of paying attention to spatial and temporal conditions propagates a succession of beneficial, fermenting cultures that eventually out-compete the malevolent and untrustworthy kind.

### **3.3. Programmatic Affirmation: Infrastructures Enabling Resourceful Communities**

Although the quest for resources and food sovereignty has made agroecological transitions a topic in design discourse, the community of practice upon which they depend requires investing in solidarities, collaborative arrangements, and infrastructures beyond the level of the single household, urban living lab, and farmstead. Commoning efforts that envision the centrality of resource cycling and food growing in the urban environment face a staggering absence of suitable infrastructure, which is necessary to establish resourcefulness (MacKinnon and Derickson 2013). The ill-equipped agroecological city expels superfluous, yet barely recoverable resources. Strategically investing in permanent improvements for leading plentiful and resourceful urban lives needs to be viewed in opposition to the utterly selective, ecologically-blind drive for ever-expanding mobility or IT infrastructure. If the city is considered as a common good and a layered outcome of accrued achievements and improvements (Stavrides 2016), then constructive opposition puts agroecological practices squarely into collective processes aimed at providing resources for food growers and urban dwellers as soil stewards over time.

The commons examples in Hong Kong, Brussels, and Berlin formulated a community among strangers who work together in response to a basic need (bowel movement), a threat (wastefulness), a desire (neighborly relations), or pure curiosity (novelty). Rosi Braidotti calls this a “programmatic affirmation” where people come together to realize what they are missing and, in turn, anticipate who they want to become: “We need to borrow the energy from the future to overturn the conditions of the present” (Braidotti and Vermeulen 2014,

188). The forward-invested spatial organization ranging from compost-friendly architecture and indoor urine reserves to edible greenery, call at once on different responsibilities as a householder, resourceful worker, or landscape provider. In such transformational potential, the commoners rehearsed different implications of constituting *we's* from conjoint action and desirability. As Dewey (1938) notes, these anticipatory collectives raise the issue of consequences over intentions, whereas responding to a common cause or threat becomes a matter of pragmatically solving problems rather apportioning blame. Commoning design then is about endorsing a social movement of assembling (novel solutions) and dissolving (inadequate fixations). It acknowledges the complex dynamics of attraction and aversion among actors within contexts while facilitating a progressive blurring of roles that allows for collective desire to emerge – including toilet-led urban revitalization, urine-based plant/human flourishing, or intergenerational agri-forestry.

This emerging collective desire for a different world can only be sustained longer-term if strangers can be enlisted to collaborate in anticipation of mutual benefit and trust (Felstead, Thwaites, and Simpson 2019). Similarly, Eleanor Ostrom (1990, 88) gauges the success of novel infrastructure creation in anticipatory communities that “share a past, and expect to share a future.” Long-term agroecological commoning means imagining an adequately equipped, food-enabling urban landscape that proliferates socio-natural resources and bio-cultural diversity. Since commoning is a situated condition, passing on generic best practices poses challenges (Botero et al. 2020). Therefore, food-enabling visions aim beyond scarcity and private property at community-based and community-led agroecological “resource hubs” (Tornaghi and Dehaene 2020) that are spatially pervasive, seasonally adaptive, and widely socialized.

Nonetheless, attempting to make urban social reproduction more agroecological entails a way of being in the world that is comfortable with visceral materiality and exposure to risk. Lauren Berlant, referring to Paolo Virno, notes: “the ordinary of the contemporary commons [is] a dispossessedness in its awkward, convoluted, observational, comic, noisy, and diversely manifest vulnerability” (Berlant 2016, 408; Virno 2004). Coping with unpredictable environmental conditions, tolerating exuberant, urine-fermenting cultures in the bathroom, adjusting to changing affinities and demands of a diverse working alliance, the infrastructuring human-waste commoners attest how moving in concert with social beings, human or not, is difficult, inconvenient and demanding (Wernli 2020). Therefore, attempting to shift from the normative infrastructures of the state and the markets into affective infrastructures of ordinary life necessitates close consideration for the social dynamics of

attraction and aversion (Berlant 2016). Anticipatory infrastructuring thus is simultaneously about ethical and technical enablement that reaches beyond activist or utopian aspirations to the quotidian routines of everyday life as experienced by frugal neighbors with common needs and a wasteful commons.

In all three example cities, the agroecological infrastructure for human-waste reuse is patchy, informal, and confined to a legal grey zone. In Hong Kong, the reuse of organic waste is left to grassroots and commercial initiatives, since dominant development and hygiene regimes impede agroecological ambitions. The Berlin example is part of a larger agroecological movement for reintegrating organic waste in urban greening efforts, where with institutional support, public eco-toilets and neighborhood-managed composting operations are on the rise. Similarly, in Brussels, nutrient resourcing is part of recently launched negotiations between socially diverse urban farmers and authorities to identify better and address their respective needs. In the global South, the compounding urgency of soil depletion, the wealth gap, and nutrient pollution are already spurring the establishment of adequately-scaled and community-owned agroecological infrastructure (Koop 2020; Gianella-Estremis, Pinzás and Latucca 2015). In Rosario, Argentina, this entails (i) facilities for gathering, storing, and transporting nutrients whereas organic clippings, industrial by-products and food waste are composted and distributed to farmers in and around town; (ii) holding capacity for rainwater harvesting in response to climate change; (iii) shared infrastructure for food preservation and processing, including access to markets; and (iv) programs and spaces for seed exchanges backed by a public seed bank. In this multidirectional context, the self-organizing basic needs of food producers and consumers have yielded social infrastructures and complementary economies that mutually support each other.

Regardless of the differences in the local context and developmental stages at which the actors are building up resourcefulness, the praxis of anticipation and its three-way transformation dynamics can be seen as a strategy in agroecological transitions and beyond. **Table 3.1.1** correlates the key concepts mentioned in this chapter upon which the anticipatory praxis builds.



**Table 3.1.1 Operational matrix of anticipatory praxis in commons design**

DOMAIN	EPISTEMOLOGY	HEURISTICS	ONTOLOGY	SOURCE
	<i>Knowing</i>	<i>Doing</i>	<i>Being</i>	
i Commons	Resource system	Community formation	Social code	Ostrom, Linebaugh
ii <b>Praxis of Anticipation</b>	Advance care	Deconstructing worldviews	Programmatic affirmation	Braidotti, Virno
iii Subjectivity configuration	Social reproduction	Conjoining trust, desire and action	Assembling and dissolving movement	Dewey
iv Agroecological transformations	Energy-food nexus (science)	Metabolic co-proliferation (practice)	Participative diagnosis and planning (politics)	Tornaghi, Dehaene
v Publicness of difference	Domesticity	Socio-technical infrastructure	Co-programming	Sohn, Stavros, Bruyns
vi Temporality	Commitment	Consequences over intention	Desirability for (dis)continuum	Carolan, Dewey
vii Roles	Producer/consumer, Knowledge-holder	Value creator	Problem-causer/ solution-holder	Tham, Fletcher

Correlation of the key concepts that anticipatory praxis in design commons builds upon

### **Conclusion: Praxis of Anticipation as Operative Mode in Commoning**

Building on the insights from agroecological human-waste ventures in Brussels, Hong Kong and Berlin, this chapter evaluated the critical dynamics behind resourceful transitions and its implications for design commons. The radical integration of the commons within resourcefulness and social reproduction implies a paradigmatic shift in subjectification processes, bio-economic value creation and programmatic facilitation – identified as praxis of anticipation. This operative term for commoning is distilled from the actual nature of human nutrients, peri-urban resourcefulness, food pedagogies, and compost-friendly infrastructure. Practitioners of anticipation confront and engage the contradictions implicit in social reproduction and its care ecologies, including domesticity, hospitality, resourcefulness and community. These shared domains and principles of commoning become values on which the exhaustion of people and the environment can be reversed. Anticipation in design commons

challenges the linear and causal determinist narratives of temporary values. Anticipation offers open-ended trajectories that allow for composition and decomposition of oblique relationships, vague aspirations, and negotiated alliances across time and space. Anticipation, through its manifold meaning of prospecting, taking care ahead of time, forestalling harm, and enthusiasm is intricately linked to dynamic renewal processes of social lives. Anticipation thus is a proposition to admit radical pedagogies of unlearning, re-learning, and aspirational ambivalence for honing not just technical but also affective ecological infrastructures that enhance the prospects of a world worth inhabiting. Thus the expression of the human waste commons is a praxis of anticipation that makes it possible to draw energy from engagement with something, or someone, yet to be grasped. It is a driving force for overturning the entrenched negating present and stepping onto the threshold of affirmative transformations. Anticipation as the *force* of nature is a tool to rework human nature, return humans to nature, and restore human waste to humus.

## **Figures**

3.1.1. Linking public eco-toilet and renewable hot tubs with place-making in a derelict park. The ecological public toilet was architecturally and socially arranged to make the metabolic stages into a collective experience. Illustration: author.

3.1.2. Linking urine upcycling and indoor planting with food pedagogy. Fermentation allowed for making urine into a viable medium for collective food pedagogy and self-discovery. Illustration: author and Sarah Daher.

3.1.3. Linking biodegradable diapers, collective composting and tree cultivation with social enterprise. The social enterprise builds on the revenue of fruit tree adoptions that support the manufacture of custom diaper inlays and the metabolic processing. Illustration: author.

## **Bio**

Markus Wernli's design praxis explores the intricate relationality of human and nature through the development of more regenerative, ecologically entangled ways of living and designing. His ongoing research draws connections between food systems and social, cultural, and local ecosystems to forge better relationships between what we breathe, eat, expel, wear, and grow. Much of his research might be considered participatory citizen science or citizen-design interventions that can be gathered under the umbrella of participatory research through design. He specializes in contextually applied and critical

research-through-design, bringing focus to the social and ecological impact of body-technology pairings and human-biosphere interactions. Markus is a research assistant professor with the School of Design at Hong Kong Polytechnic University and held appointments at the College of Asia and the Pacific at Australian National University in Canberra, Zokei University of Art and Design in Kyoto, and the Multimedia Studies Program at San Francisco State University.

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## Notes

<sup>1</sup> Human waste is part of a massive “global translocation of feeds.” The nutrients, water and energy extracted from an ecosystem on one side of the world are transported as packaged crops or food across the world, then consumed and eventually deposited as excrement into ecosystems on the other side of the world. While these effluent nutrients lead to toxic manure lakes, suffocating water bodies, and potent greenhouse gas emissions, petrochemical fertilizers applied to soils do not sufficiently replenish them in the long run (Waltner-Toews 2013, 120).

<sup>2</sup> Compared to conventional human-waste composting that requires up to five years for pathogen-removal in temperate climates, Terra Preta Sanitation is considered a speedy bioremediation process (Andreev et al. 2015).