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Building as common property: examining Ostrom's model in an innovative university residence hall

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ABSTRACT

Buildings are not only physical infrastructures but also socially and institutionally produced environments that structure access to space, resources and community life. This study draws from human–environment geography, common property theory and scholarship on built environments to conceptualize buildings as shared indoor environments that function as common pool resources and can be governed as common property regimes. Using an ethnographic approach, we examine a large, mixed-use academic–residential building at a U.S. research university to better understand how it was produced and governed as a shared resource. Data from stakeholder interviews, institutional documents and participant observation reveal governance dynamics that align closely with Ostrom's design principles, including clear boundaries, collective choice, monitoring and sanctions. We identify both the institutional mechanisms and spatial strategies that contribute to sustainable, cooperative use of shared indoor resources. We also propose a conceptual framework that links building governance to broader national design trends, institutional mental models, and localized scarcities and abundances. Our findings offer practical insights for designers, campus planners and institutional decision-makers seeking to foster more inclusive, adaptive and sustainable building use.

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Introduction

It can hardly be debated that buildings are valuable resources. In the US alone, people spend approximately 87% of their lives in buildings living, working, learning and healing (Klepeis et al., 2001). Yet, few have examined how buildings are produced and governed as shared resources, specifically spaces, infrastructures and materials that are collectively accessed, used and maintained. Geographers especially, despite their long-standing interest in environments and landscapes, and the resources they bear, have made limited contributions to the study of indoor environments, with some exceptions (Day Biehler & Simon, 2011; Mahdavi, 2020), though focus on buildings as new sites of remote sensing and spatial analysis is burgeoning (Chen & Clarke, 2020; Karki et al., 2024; Park & Kwan, 2025)

But what types of resources are buildings? Over time, ambitions regarding indoor space have grown from simple notions of shelter to sprawling ideas of connectedness (Day, 2012; Evans, 2003). Increasingly, we design buildings not just to support users' needs but to

promote certain outcomes like learning (Strange & Banning, 2015), wellness (Allen & Macomber, 2020), creativity (Doorley & Witthoft, 2012) and community (Fayard & Weeks, 2007; Sailer & Penn, 2009), greatly broadening the range of resources and benefits that indoor spaces offer. Furthermore, buildings are often shared by many people. This could be an apartment building with multiple private residences and shared amenities under a common roof, or a sprawling office building with a network of collaborative workspaces. In either case, buildings may be comprised of a wide variety of spaces, or patches, that each provide an array of resources including space, light, electricity and comfort creating affordances for occupants' activities and interactions (Maier et al., 2009; Villarreal et al., 2025). In this way, many buildings are shared indoor environments.

Framing buildings in this way raises important questions. First, how are buildings produced as shared indoor environments? Second, how are they governed? These are primarily social questions and here we

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propose a simple hypothesis, familiar to many who study shared resources in other contexts: buildings are common pool resources, and their governance strongly resembles a common property regime.

A common pool resource is a type of resource that is rivalrous and non-excludable (Ostrom, 1990), meaning that one person's use reduces the availability for others and that it's difficult to exclude others from using it, respectively. Examples include fisheries, groundwater basins, grazing lands, forests and irrigation systems. Because common pool resources are shared, they are prone to overuse and degradation, what's often called the tragedy of the commons (Hardin, 1968), unless users develop effective rules or institutions to govern them sustainability, or common property regimes.

To address these concerns, we leverage valuable insights in the fields of geography, common property and built environments to examine a new and innovative residence hall on a university campus and evaluate the hypothesis that its production and governance resemble a common property regime. In this way, we hope to present a new and potentially useful approach to better understand how built environments and shared indoor spaces work.

Conceptual framework

Our study begins from this conceptualization of buildings as shared indoor environments. Figure 1 presents this visually in five steps. First, administrators, designers and builders produce shared indoor spaces, often with the intention of promoting collaboration, community and creativity (Diep, 2020; Jens & Gregg, 2021; Knox, 2020). Also, these groups create the initial strategies to manage shared spaces and resources. Second, indoor spaces both are, and contain, valuable resources that building users leverage to live and work. These may include spaces for collaborative activities and projects, furniture, electrical outlets, comfort and privacy. Third, diverse individuals and groups seek these resources within this shared indoor environment. In this way, buildings serve as common pool resources that are subject to overuse and degradation (Adams et al., 2003; Hardin, 1968). Fourth, many aspects of resource use are regulated by formal policies and monitored by appointed managers in ways that strongly resemble a common property regime (Nonini, 2006; Ostrom, 1990). Last, human–building interactions, specifically resource use, can be disrupted by routine events like the seasonal turnover of building users, which necessitates the recurring acculturation of individuals and groups (Gunderson & Holling, 2002). Alternatively, disruptive policy violations highlight how

tragedies of the commons could proliferate in the absence of a common property regime.

Viewing buildings as sites of common property regimes provides multiple conceptual advantages. First, it highlights the roles of shared governance and collective responsibility in buildings by focusing attention on the rules, norms and decision-making structures that shape how indoor spaces are produced and governed. Second, mixed-use buildings often blur the lines between residential, commercial and communal domains. Thinking in terms of common property helps to explore these boundaries as negotiated and contingent rather than fixed, inviting questions about access, inclusion and social hierarchies. Third, a commons perspective can support sustainability by encouraging collective stewardship of a building's finite resources. Fourth, a focus on common property can draw attention to social cohesion and collective identity within a building. Applying this lens encourages questions of how diverse users form, or fail to form, a sense of mutual obligation or community.

Background

Given this conceptualization, our study engages scholarly discussions in human–environment geography and common property theory, with special attention to their engagements with built environments. These approaches offer valuable perspectives on how shared spaces may be governed through formal and informal norms, material configurations and everyday practices that reflect broader tensions between individual autonomy and collective responsibility.

Human–environment geography

Scholarship on human–environment interactions has a long tradition in geography and related fields, with close attention to resource use, especially of shared resources within a local environment. Early research focused on landscapes and the role that the environment can play in the development of culture (Steward, 1955). The field of cultural ecology focused on groups' adaptive strategies to manage resources in response to environmental constraints. Here, resources were controlled by local communities and key drivers of change were environmental limitations and technological innovation (Lansing, 1991; Netting, 1993). Alternatively, the field of human ecology grew to see resources as part of complex social–ecological systems, driven by population dynamics, energy flows and feedback loops. Again, technology was seen as key driver, alongside population pressure and ecosystem feedbacks

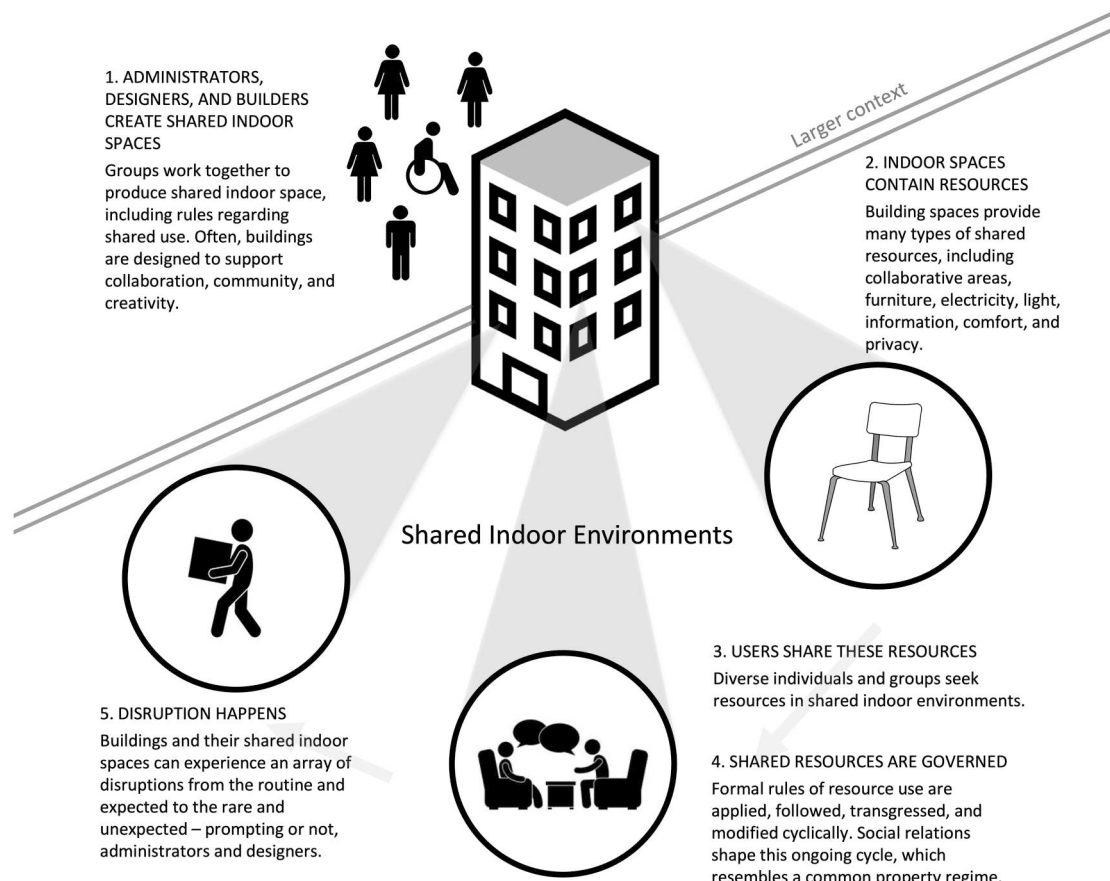


Figure 1. Conceptualization of buildings as shared indoor environments.

(Rappaport, 1968). With human ecology, the notion that resources were ‘controlled’ was replaced with greater concern for balance and sustainability (Moran, 2006; Turner et al., 2003). Then, in response to what scholars viewed as ‘apolitical ecologies’ that ignored the larger political and economic contexts of resource use and environmental degradation, the field of political ecology emerged to offer a critical, structural lens that highlighted how resource use is driven by power relations within political-economic systems (Blaikie & Brookfield, 1987). In this light, colonialism, capitalism and political struggle have been foregrounded as key drivers of resource control and use (Peluso & Watts, 2001; Robbins, 2004).

While these currents of scholarship have primarily focused on ‘natural’ environments, each has also engaged to some extent with the built environment. With cultural ecology, the built environment was implicit through vernacular architecture, terracing, irrigation infrastructure and settlement patterns (Netting, 1981; Steward, 1938). The emphasis here was on how buildings, infrastructures and layouts optimize access to, and use of, local resources (e.g. water, fuel, shelter). Conversely, scholarship in human ecology, viewing

built environments as ecosystems, was more focused on how the built environment shapes the flow of resources, from extraction to consumption (Grimm et al., 2008; Pickett & Cadenasso, 2002). And political ecologists, concerned with power and inequality, have targeted who gets access to the built environment and its resources, who pays, who controls things, and how these dynamics reconfigure social and ecological relations (Simone, 2004; Swyngedouw, 2004).

Common property theory

In many ‘natural’ environments, resources are shared or held in common. Decades ago, scholars were concerned that shared (*i.e.* open-access) resources would lead to environmental degradation as individuals sought private benefits at group expense (Hardin, 1968). In response, scholars have detailed how groups around the world create and maintain common property regimes to manage commonly held resources (Feeny et al., 1990; Ostrom, 1990). This work emphasized the importance of local rule, norms and institutional arrangements in sustaining collective access to resources like fisheries (Osmundsen et al., 2021), forests (Agrawal

& Gupta, 2005) and grazing lands (Moritz et al., 2013). Scholars in geography and anthropology extended this work, highlighting the socially embedded nature of common property regimes (Agrawal, 2003; Turner, 1999). And recent work has examined how commons emerge from community gardens (Eizenberg, 2012), to digital knowledge and platforms (Bollier & Helfrich, 2014; Hess & Ostrom, 2007;), to housing and urban space (Harvey, 2012; Huron, 2015).

Built environment

In addition to perspectives from human–environment geography and common property theory, several related bodies of scholarship offer insight into how shared environments are designed, governed and used. Evidenced-based design research, for example, demonstrates how spatial configuration influences user behaviour, interaction and outcomes in built environments (Hamilton & Watkins, 2008). Similarly, work on urban commons focuses on conflicts over the use and control of public space, highlighting the importance of collective rights, access and spatial justice in urban settings (Foster & Iaione, 2015; Stavrides, 2016). However, these studies typically examine contested or reclaimed spaces, rather than environments intentionally designed for shared use. Also, scholarship on soft commons, such as co-living (Bhatia & Steinmuller, 2018), co-working (Avdikos & Pettas, 2021) and co-housing (Tummers, 2016), offers important insights into informal governance, negotiated access and social dynamics in shared spaces.

While these studies focus carefully on how shared spaces are experienced and managed by users, they often overlook the initial design processes and institutional strategies that precede those experiences. Furthermore, they comprise a diverse body of scholarship on the built environment, which underscores the importance of space, governance and shared resource use, but leaves a gap in understanding how shared indoor environments are intentionally produced, physically and institutionally, to function as commons.

Gaps, opportunities and research questions

Taken together, these scholarly traditions reveal important gaps in our understanding of how humans interact with certain environments and point to potentially fruitful strategies to examine shared indoor environments specifically. Buildings especially are produced actively through social, political and technological processes. Nonetheless, few studies have examined how these processes unfold and what forms they take,

particularly from the perspective of collective use. This study approaches buildings as sites of spatial governance, where formal systems and informal norms intersect to produce indoor space and manage access, resource use and shared responsibility. Correspondingly, we seek to address two broad research questions:

RQ1. How is a shared indoor environment produced and governed?

RQ2. How can this process be organized conceptually?

Methods

Study site

To address these research questions, our team examined a hybrid academic-residential building on the main campus of a large, research-intensive university in the U.S. Completed in 2021, this 224,660 ft² building contains many types of space. First, it serves as a residence hall for 596 undergraduate students. Residents belong to one of four constituent groups, including three themed living-learning communities (LLCs) focused on art, entrepreneurship and design for global challenges. Approximately one quarter of residents are student athletes. Second, the building houses numerous academic spaces for both teaching and research. Building spaces are described in detail in the findings section, which also includes a building map.

Ultimately, the building is a compelling site to examine human–building interactions in an environment that was designed to promote community, that provides

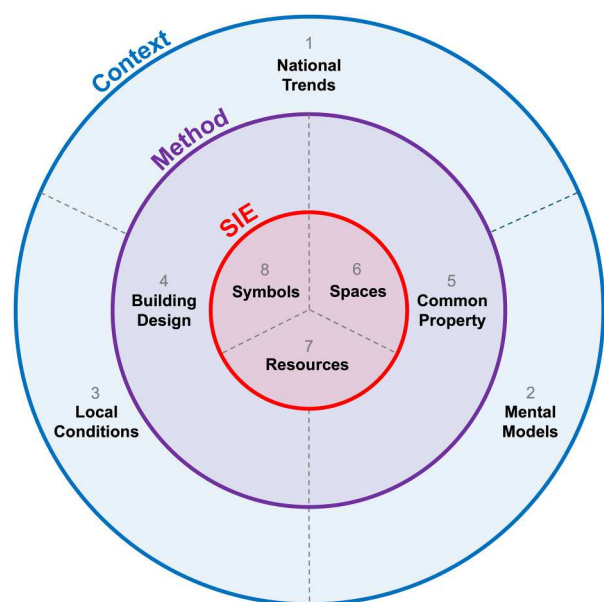


Figure 2. Conceptual framework of the production of a shared indoor environment (SIE).

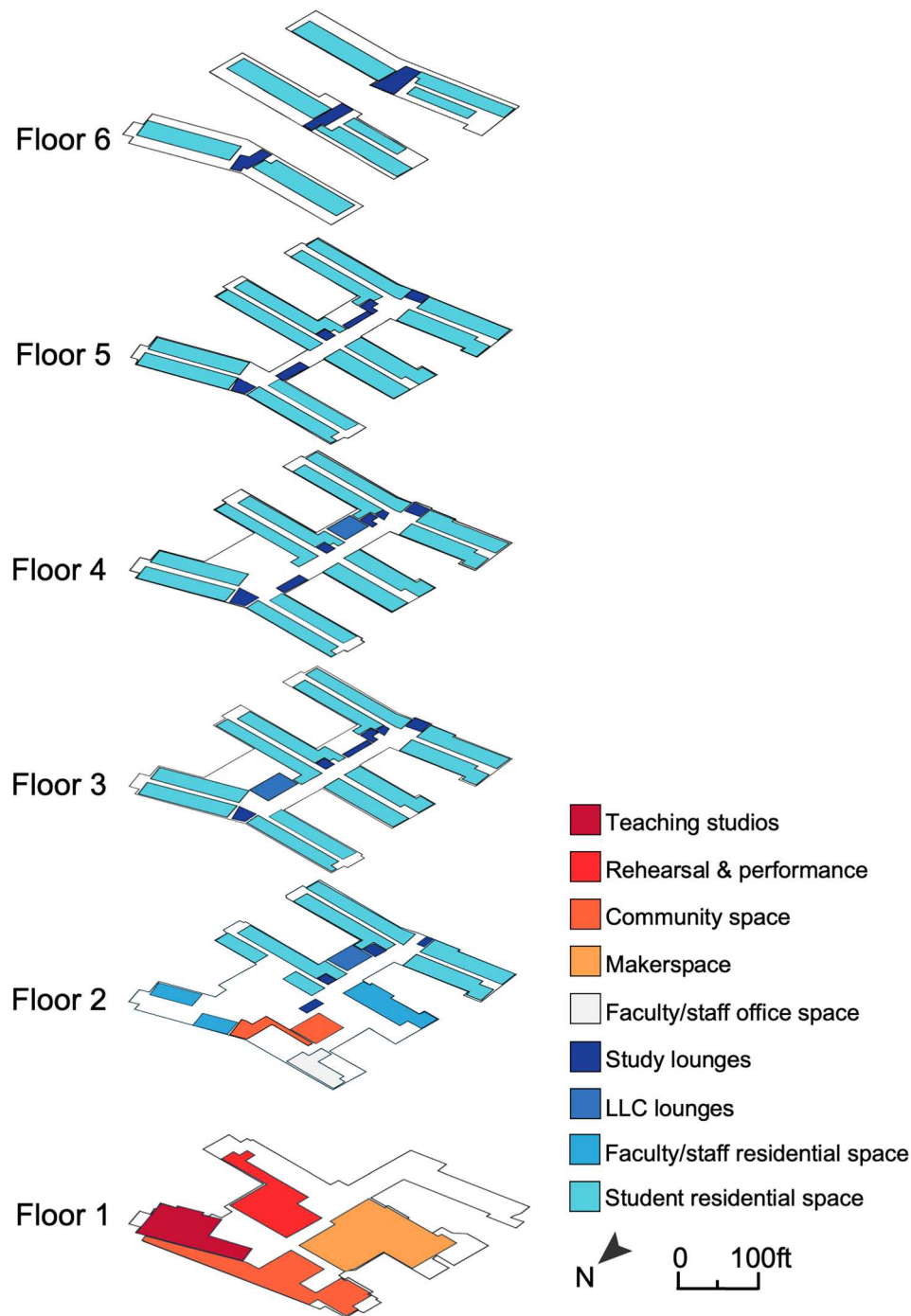


Figure 3. Building map of space types.

diverse types of space and contains diverse users. In this way, the building resembles many existing educational and professional buildings.

Data collection

To better understand institutional design and governance in this building, we used an ethnographic approach. Through semi-structured interviews with

stakeholders, document review and participant observation, we traced how the building's design processes, stakeholder dynamics and spatial arrangements reflect the characteristics of sustainable commons governance.

Our data collection proceeded in multiple steps. Beginning in 2023, we conducted semi-structured interviews with key building stakeholders, specifically administrators and designers ($n = 10$), to identify the key antecedents, guiding values and specific objectives

Table 1. Descriptions of interviewed stakeholders.

	Building stakeholder	Project contributions
1	*Former senior official in student affairs	Led early renovations of existing residence halls, and ultimately the conceptualization and financing of the building
2	*Current senior official in student affairs	Oversaw many logistics associated with building design and construction
3	*Official in capital projects	Oversaw day-to-day construction activities
4	*Senior official in capital projects	First project manager of building construction. Became supervisory project manager. Involved in hiring the initial architect, then selecting the final design/build team
5	*Senior official at interdisciplinary research institute	Member of university executive team who facilitated discussions between student affairs, capital projects, and multiple academic units. Contributes financially to ensure effective use and maintenance of academic spaces
6	Principal, architecture & design firm	Contributed to final design as member of design team
7	Design team, architecture & design firm	Led final design of building. Design team leadership, including chairman, CEO and project manager
8	*Senior official in athletic department	Oversaw facilities and operations for athletics department. Participated in design planning
9	*Official in interdisciplinary research institute	Coordinates and monitors shared use of academic spaces within the building
10	*Official, Residential Wellbeing & Inclusion, Student Affairs	Supervises student resident advisors who monitor building spaces and building users' behaviour

* Current or former university employee.

that shaped the production of the building, and how resources, community and placemaking were envisioned during the design process (RQ1 and RQ2). Table 1 presents interviewees' positions and roles.

Interviews focused on: (1) perceived design trends and objectives for mixed-use space in higher education; (2) discussions surrounding specific design objectives for the study building; (3) decision making and value engineering processes; and (4) strategies and objectives associated with the distribution of spaces and material resources within the building. Ultimately, we sought to understand stakeholders' perspectives on the different types of space, resources and assemblages, the affordances these are meant to provide, and whether and how these spaces are meant to facilitate shared use and collaboration. In some cases, we discussed the specific characteristics of common pool resources and common property regimes with interviewees to identify whether these were evident in the study building.

Second, multiple interviews referenced key documents describing the context within which the study building was produced, including: (1) a *Washington Post* article detailing a shift in university housing strategies; (2) an article authored by the respondent on

types of residential life published in a higher education journal focused on enriching the student experience; (3) a technical report on campus life and the student experience commissioned by the university provost and drafted by an internal working group published in 2015; (4) the building's criteria document, which was produced by an architectural firm in concert with university representatives, and used to solicit design/build proposals from outside firms; (5) the building's shared-use memorandum of agreement (MOA) between multiple university units/departments; and (6) a sample roommate agreement.

Third, this ongoing study has also been informed by sustained participant observation. The first author has lived in the building for over four years, residing with his family in the faculty apartment and working an office located on-site. This long-term immersion allowed for regular observation of how shared spaces are formally and informally governed. Observational data were recorded intermittently through journals and voice memos, though the volume and continuity of daily experience defied systematic cataloguing. Rather than serving as a standalone dataset, participant observation shaped and supported this study in multiple ways: it informed interview protocols, contextualized documents and guided analytical interpretation. Insights gained through residence allowed the research team to triangulate findings and to identify informal practices and social dynamics not explicitly documented elsewhere. Where applicable, the findings section highlights these observations as well as points of convergence between participant observation and other data sources, especially for matters related to the building's governance.

Importantly, all research activities were approved by Virginia Tech's Institutional Review Board to ensure adherence to ethical standards for research involving human subjects. Furthermore, residents were routinely made aware of TB's dual role as a resident faculty member and principal investigator of this study. Last, observational insights have been anonymized and interpreted with care.

Data analysis

We employed a qualitative content analysis approach to examine hundreds of pages of interview transcripts, institutional documents and field notes. Our analysis combined deductive and inductive strategies: we began with a set of sensitizing concepts drawn from common property theory (e.g. Ostrom's design principles), while remaining open to emergent themes that surfaced from the data. To support the organization

and transparency of our coding process, we used Atlas.ti software for data management. This platform allowed us to structure the analysis systematically, facilitating the coding, retrieval and comparison of themes across multiple data sources. Codes were applied iteratively, with team discussions to refine the codebook and ensure consistency. These strategies enabled us to trace how institutional design processes, governance practices, and spatial arrangements were articulated and experienced across different stakeholder perspectives and ultimately informed our understanding of how the building was produced and governed (RQ1) and how these could be organized conceptually (RQ2).

Findings

Content analysis of our interview transcripts, key documents (typically referenced by interviewees), and field notes, highlighted several themes that span broad temporal and spatial scales. To organize these findings, we devised a conceptual framework of the production process (RQ2). [Figure 2](#) presents this framework across three levels: (1) the context in which the shared indoor environment (SIE) was designed included national trends, institutional mental models, and local scarcity and abundance; (2) the method of designing the SIE reflects the key tenets of building design and aligns with characteristics of common property regimes; and (3) the SIE itself is comprised of spaces, resources and symbols. In the sections that follow, we describe which data sources are associated with each finding.

Context

The broad context within which this shared indoor environment was produced includes national trends, mental models and local conditions, each of which is described below.

Context: national trends

On the topic of housing trends in higher education, one of our respondents noted that he had published an article in 2011 on university housing in a journal for practitioners and researchers (Shushok et al., 2011). It described three conceptual models of residential life that are common in higher education. The ‘sleep and eat model’ separates traditional academics and student affairs (e.g. housing, dining, etc.), and treats ‘dorms’ (from the latin root *dormire* meaning to sleep) as strictly student spaces for the lone purpose of rest following classroom-based learning. In the ‘market model’, universities engage collaboratively with private developers to build ‘the kind of housing students want these

days’, flush with amenities. Last, the ‘learning model’ views residential buildings as critical spaces to advance students’ educational outcomes. This respondent noted that the study building was born of this last model.

A different respondent described an alternative version of the marketing model wherein university housing competes directly with off-campus housing. In each version of the model, housing options have focused heavily on providing amenities like pools, on-site gyms, single rooms and apartment-style suites.

Student resident space, for a long time, has been really about efficiency. How do you house students, and give them what they need? And then in the ‘90s and 2000s, some institutions decided that their market was to compete with off-campus housing. How do we make on-campus living feel as comfortable as off-campus living? So, some universities really went into building apartments, building suites, thinking about amenities. There’s another trend that was happening at the same time, which I think [our university] has wholeheartedly adopted, which was ‘We’re never going to win amenities.’ The strategic advantage for [the university] is not amenities-based housing. It’s an integrated co-curricular and curricular environment for students, the living-learning community. We went all in on that.

This idea was echoed in comments offered by a senior representative from the architecture and design firm that handled the building’s final design, who remarked that one of the biggest changes in the past 15 years has been “intentionality”, noting that campus housing had previously focused on simply housing students, and not on outcomes related to learning and wellness.

Context: mental models

Amidst broader trends in campus housing, decisions regarding large capital projects, like our study building, can be strongly shaped by the mental models of key administrators and stakeholders. Interviews with senior administrators revealed that the early process of conceptualizing, and ultimately ‘green-lighting’ the study building would not have been possible without first shifting entrenched mental models of university residence halls through stepwise renovations in pre-existing campus spaces. A senior university administrator noted, ‘I don’t think we could have ever made the case for [the study building] if we hadn’t done [residence hall A], if we hadn’t done [residence hall B]. I mean, no one had a mental model for that’. Here, the respondent references earlier renovations to existing halls that added faculty apartments and various learning spaces for the first time at this university.

Years before discussions surrounding the study building began, administrators faced decisions situated

amidst the competing trends in higher education residential life. These were described by two respondents. In 2009, during his first week in his new position, one respondent toured a 1960s-era residence hall that was being renovated as a 'resort-like facility, complete with movie theatre, gym, gaming room, and a salon with affordable spray tanning' (Johnson, 2011). He described being shocked, how he paused the renovation and spent the following month lobbying for an alternative design. 'People thought we were crazy! They thought we were crazy when we suggested that a faculty member live in residence'. When asked how people responded when presented with the idea that the model had been used in places like Oxford and Cambridge, Harvard and Yale, for centuries, he responded 'No one has a mental model for that. They haven't seen it'. A respondent from the architecture and design firm echoed this sentiment noting that at many other universities, administrators say 'Well, we don't have faculty or staff that really understand it or would really want to engage. Why would they want to live in residence?'

Ultimately, plans for this earlier renovation shifted. The salon was jettisoned and 18-revenue generating student rooms were removed to make space for two rent-free faculty apartments. Other aspects of the renovation were reconceptualized as spaces to support learning, including the game room and theatre.

Following the renovation, the provost established a task force to evaluate the student experience at the university. This group, comprised of administrators, faculty and students, spent a year studying campus spaces, student experiences and outcomes. Key findings included: (1) 'physical segregation [of departments and other units] perpetuates silos'; (2) 'inflexible building design and construction standards too often inhibit programmatic performance as new needs emerge' and (3) 'spaces fail to invite students, faculty and staff to gather informally outside the classroom'. In 2018, the renovation of a second residence hall replaced several student rooms with a faculty apartment, offices, a classroom, a community kitchen and collaborative lounge space.

Insights from these renovations and the task force's report (Holloway & Shushok, 2015) helped to shift mental models on campus and set the stage for discussion of an even more ambitious space, the study building. In one interview, a respondent described college as 'an intervention' and suggested that universities' goals should be to maximize the effect of the intervention. One 'huge asset', he claimed, 'is student time, in a space'. He described how students spend most of their time in residence halls, but historically these spaces haven't been designed to produce intentional outcomes, like learning or wellness. As noted above, the design of

these spaces has focused on efficiency of maximizing beds per square foot and providing bathrooms and laundry. Residential spaces, and the time students spend in them, were not being leveraged enough.

The residential environment is a pretty powerful tool, but you've got to shift what happens in there and who is there. And to shift who is in there, you've got to shift what happens in there. So if you take the [study building], who do you want in that building?

He asked.

You wanted to have the artist, and the scientist, and the senior, and the first-year, and the faculty, and the staff, and all of the conversations and kinds of people in between. You had to create an environment that facilitated those collisions.

And if you don't put the types of spaces that those people need under one roof,

then those collisions are less likely to happen. And not only that, they're less likely to happen anywhere on campus. So there's no other place at [the university] where what's happening at [the study building] is happening. It's a complete experiment in designing how people come together.

This respondent summarized the primary goal of this mental shift: 'So over 13 years, what we're trying to do is to reformat who comes in buildings ... and who lives in buildings'.

Context: local conditions

Respondents described how multiple local factors, which we broadly categorize as forms of scarcity and abundance, shaped how the study building was created. First, scarcity of campus housing limited the university's capacity to grow its enrolment. Multiple respondents noted that the university's dual goals of (1) growing the undergraduate student population and (2) providing an on-campus residential experience for all first-year students, were brought into tension by the fixed stock of campus beds and the long timespans required to envisage, plan, finance and build new residence halls. Furthermore, quality campus housing was lacking. Specifically, the athletics department needed improved housing, including apartment-style suites with single bedrooms, to help recruit top student athletes to the university.

Second, scarcity of certain campus academic spaces shaped both the conceptualization of the study building and the nature of the student living-learning communities that would be housed within it. The university's schools of visual and performing arts had long suffered from a shortage of adequate teaching and research

Table 2. Key tenets of building design and examples in the study building.

Key tenets of building design	Description	Study building
Functionality & usability	Focused on specific needs of intended use and adaptability for future changes	Key user groups, including multiple academic units, residential life, undergraduate students and facilities personnel consulted with designers to identify key functionality and usability criteria
Sustainability	Focused on energy efficiency, water management and materials with low environmental impact	The building was designed to meet the standards of the Leadership in Energy and Environmental Design (LEED) Silver rating. For example, to promote energy efficiency, the building has inoperable windows
Aesthetics & context	Focused on design that complements surrounding environment and exhibits respect for local historical and cultural contexts	The building design complements the surrounding environment in multiple ways, including stone facia, which is ubiquitous on campus, and gabled roofs, used primarily for residential buildings. Located on the town/campus boundary, the building has a grand entryway on its town-side to welcome visitors into its public/academic area. Also, glass is used liberally throughout the building to invite outsiders to see the activity inside
Health & wellbeing	Focused on air quality, natural light, thermal comfort and design to support wellbeing	Abundant glass affords natural light throughout the building. Similarly, multiple green roofs and outdoor patios reflect designers' intentions to promote wellbeing
Accessibility & inclusivity	Focused on safety and accessibility for people of all ages and abilities (<i>i.e.</i> universal design)	The building incorporates technologies for building management (<i>e.g.</i> smart HVAC, lighting, security), including infrastructure for digital connectivity and future technologies. An electronic access control system tied to ID cards, regulates building users' access to different spaces, both residential and academic. The building also includes a building-scale digital display system for communication and presenting visual media
Technology integration	Focused on technologies for building management (<i>e.g.</i> smart HVAC, lighting, security), including infrastructure for digital connectivity and future technologies	The building incorporates technologies for building management (<i>e.g.</i> smart HVAC, lighting, security), including infrastructure for digital connectivity and future technologies. An electronic access control system tied to ID cards, regulates building users' access to different spaces, both residential and academic. The building also includes a building-scale digital display system for communication and presenting visual media
Economic feasibility	Focused on balancing initial construction costs with long-term operational and maintenance savings	Typically, residence halls pay for themselves through 'rent' charged to residents. Similarly, classroom spaces can be paid for through tuition. By contrast, community spaces for lounging or studying are non-revenue generating spaces – and the greater the proportion of these spaces in a building the more challenging it can be to finance them. Importantly, debt-service for this building is not covered entirely by the fees paid by the residents and others who use the building but is supplemented by income from other campus buildings that are paid off
Community & stakeholder engagement	Focused on involving stakeholders and future users in design process	Many different groups, including future users, participated in the design of the building

spaces on campus. One respondent noted that the university was

struggling with some of the spaces that were built in the [study building]. We needed a performance space. We had a visual arts program that needed studio space. And there was a convergence of ideas around “What if we brought together living-learning communities that were specifically focused on creativity and innovation [which already existed on campus] with a need that the provost’s office was identifying [*i.e.* the arts].”

Third, local forms of abundance also influenced the study building. In the prior decade, while the university was focusing its attention and resources on renovating multiple existing residence halls, improving their quality but not growing the number of beds on campus, multiple private developers greatly increased the off-campus housing stock adding new apartments, suites and amenities. This local trend strengthened campus’

administrators resolve to differentiate its campus housing stock from off-campus options and leverage its competitive advantage by integrating co-curricular programming, including LLCs and residential faculty members, into its housing strategy.

Method

Within various broader contexts from national to local scales, the method of production necessarily involved key tenets of building design. Importantly, it also reflects the tenets of a common property regime, our key hypothesis. Here we describe these two methods of production.

Method: building design

Interviews with respondents highlighted the ways in which the production of the building addressed the

key tenets of building design, which we synthesized from key sources (Architects, 2013; Ching, 2023; Council, 2008). Table 2 describes these tenets and their embodiment in the study building.

Method: common property

Given our hypothesis that the production and governance of this shared indoor environment resembles a common property regime, we describe in some detail how each of its tenets is evident, or not, in the study building.

Also, while this paper is focused primarily on the production of the study building and the extent to which this was a community-based endeavour, it's important to reiterate that the community that produced the study building and the community that uses it are not entirely the same. Designers, administrators, faculty and students collaboratively designed the study building, which was constructed over multiple years, for future cohorts of students, teachers, and administrators who have come later to use and govern its resources.

Going forward, we describe aspects of the building that are most relevant to our effort to evaluate the appropriateness of the common property regime model in this context. Descriptions are stratified between those addressing the factors associated with the production of the resource/s and those associated with its governance.

Clearly defined boundaries. This criterion states that the resource and its user group must have clear boundaries. This helps prevent free-riding and ensures that the benefits and responsibilities are shared among legitimate users. *Production:* The process of producing the building, especially its design, involved multiple steps, with appropriate groups participating at each step. *Governance:* The completed building contains many clearly defined spaces and corresponding user groups. Access to these spaces, which can vary by time of the day or year, is regulated by card access.

Congruence between appropriation and provision rules. This states that the rules for using the resource (*i.e.* appropriation) and for maintaining it (*i.e.* provision) should fit local needs and conditions. *Production:* While stringent rules are contractually stipulated for design and construction firms, arrangements vary for the stakeholder groups on the client side (*i.e.* the university). Many of these, including students and faculty, were involved in both the design of building spaces and other resources like furniture. In some cases, groups either under or over contributed. One administrator

described how a facility operations group responsible for the long-term maintenance of the building would miss key design meetings or send representatives lacking authority to make decisions about critical issues. Then when problems arise with the completed building, this group will complain that these issues weren't handled properly. In another case, a group became 'the tail wagging the dog'. Here a group responsible for leading the design of multiple spaces within the building, albeit spaces representing a comparatively minor amount of square footage and relatively low dollar value, began to impede the whole project through missed deadlines and delays that impacted core building systems. *Governance:* Rules regarding appropriation are aligned with local conditions and sustainable use. For example, one respondent described how the use of formal learning spaces is regulated by a shared-use MOA between multiple administrative units, which document analysis confirmed. Similarly, another respondent noted that the use of residential spaces is regulated by housing contracts between individual residents and the university office of residential life. Furthermore, roommates often complete formal agreements with each other regarding issues like noise, trash and sleep, which can be referenced later if conflicts arise. Notably, in one building space, a respondent noted that one administrative unit bears a disproportionate burden of provisioning a critical resource (*i.e.* art supplies) relative to its appropriation. Managers recognize this incongruence and monitor provisioning closely.

Collective choice arrangements. This states that most individuals affected by the rules can participate in modifying them, ensuring buy-in. *Production:* Given the novelty and mixed-use nature of this building, multiple respondents noted that flexibility was prioritized, and rigid rules were avoided where possible. In one example, well after the start of the project, a group of design-focused faculty and students saw the building as a rare and valuable pedagogical resource and lobbied to participate in the production process. This group was ultimately granted some access to the project, however, challenges followed, which we discuss below. Another production innovation described by a respondent was that project managers 'bookended' full stakeholder group meetings with smaller meetings of an executive committee to facilitate timely planning and decision-making. This new model was found to be effective and has been used as part of the production process of new mixed-use buildings on campus. *Governance:* While rule modification has been rare since the building opened in 2021 some examples are evident. According to one respondent, the MOA regarding academic spaces

was updated to include language that the agreement would be reviewed and updated annually. In another case, a faculty office was repurposed as a storage space for instruments. A respondent with knowledge of the MOA noted that, over the years, multiple requests to use a shared meeting room to teach a class have been denied to avoid setting a precedent that would likely lead to dozens of requests each semester, but also that reasonable requests to modify the agreement will always be considered by the shared-use committee. For example, students and faculty, citing excessive noise, have both successfully lobbied for changes to the hours of operation for music practice rooms and certain machines in the makerspace, as author TB has regularly observed. In non-academic spaces, especially residential spaces where students are the primary resources users, they have had opportunities to petition and modify operational rule, including adjustments to policies limiting: (a) card access to select building entrances and (b) use of empty wall space for hanging flyers, etc.

Monitoring. This states that monitors, who actively audit resource conditions and user behaviour, are accountable to the users or are the users themselves. **Production:** The process of designing and constructing a building involves a great deal of monitoring to ensure that the project finishes on time and within budget, a point made by multiple respondents. **Governance:** Several respondents described how multiple individuals, including author TB, and groups bear some responsibility for monitoring spaces and behaviour within the building. Furthermore, these people use the building and/or are accountable to building users insofar that users can provide feedback to monitors' supervisors. The primary monitor of the academic spaces is an official who leads a shared-use working group, collaborates with leaders of the residential spaces and reports to a building executive committee. TB observed that several others serve as formal and informal monitors for spaces throughout the building, including paid student leaders (*i.e.* resident advisors), university employees leading living-learning programs and housekeeping staff. In each case, these individuals live and/or work in the building, use its resources and the great majority participate in its community building programs.

Graduated sanctions. This states that users who violate rules face sanctions based on the severity and context of the violation. **Production:** During the building's design and construction phase, one respondent described how the 'tail wagging the dog' group was pressed repeatedly about deadlines. Ultimately the larger production team determined that the group was undermining the

project and reduced its access. **Governance:** Graduated sanctions are commonly used where rules regarding use and maintenance are not followed. Shortly after the building opened in 2021, TB observed that convenience trash bins were removed from the large community assembly space when many residents failed to bring their personal trash to dumpsters outside the building as their housing contracts specify. In another example described to TB, following multiple warnings regarding misuse of a shared community lounge, a student groups' access was first limited and then forfeited entirely for the remainder of the semester. It can be difficult to identify the specific individuals responsible for misuse and often sanctions are applied to larger groups. Similarly, one respondent described how 'community billing' can be levied for damaged or stolen communal furniture. Faculty have also been subjected to sanctions including loss of key card access to certain spaces for perceived misuse, as TB has experienced. Another respondent described how an academic department was given access to community space within the building to host an event of a specified size. The event, however, greatly exceeded this size and the department's subsequent requests for space were much more tightly evaluated and access more limited.

Conflict resolution mechanisms. This states that there are accessible, low-cost means for resolving conflicts among users or between users and officials. **Production:** Respondents did not highlight specific conflict resolution mechanisms related to the initial design and construction of the building, though multiple did indicate that collaborative efforts between stakeholder groups ran quite smoothly, with only occasional exceptions (*e.g.* the 'tail' group described above), which were discussed at stakeholder group meetings. **Governance:** Various mechanisms exist to resolve conflicts, which can range from roommate challenges to strained professional relationships and space conflicts. Respondents described multiple types of conflicts and how various systems were leveraged to resolve them, including embedded counsellors for students, the shared-use committee for academic space concerns, and even the human resources department for staff conflicts.

Minimal recognition of rights to organize. This criterion states that user's rights to organize, for both *Production* and *Governance* are recognized. Our data collection, including TB's observations living in the building, produced no evidence that this right does not exist. Furthermore, we identified two examples, besides the 'wagging tail' team, where groups lobbied to make adjustments: (1) building representatives, including

TB, have organized to successfully lobby the building's executive committee for more flexible access to the visiting fellow apartment; and (2) student resident advisors have organized, with some success, to gain access to certain restricted spaces.

Nested enterprises. This states that where common property regimes are part of larger systems, governance activities are organized in layers of nested enterprises, which supports scaling and coordination. *Production:* Several respondents described how the design and construction processes included multiple layers of nested administrative units including multiple stakeholder groups within the university, as well as the architecture, design and construction firms. *Governance:* Likewise, as TB observed routinely over the course of daily life in the building, its use and maintenance rely on nested enterprises including student living-learning communities, resident advisors, a shared-use working group, building executive committee, multiple academic units and university facilities (e.g. maintenance and housekeeping).

Shared indoor environment

Here we describe the final outcomes of the efforts described above, specifically the study building's spaces, resources and symbols. Here spaces and resources represent types of material resources at larger and smaller spatial scales, respectively. Alternatively, symbols were designed, and are routinely leveraged, to promote engagement, community sentiment and culture.

Shared indoor environment: spaces

The finished building integrates several different space types, including learning, living and support spaces across more than 132,000 ft² of assignable floor space. It also contains approximately 92,000 ft² of unassignable space, typically comprised of lobby areas and hallways that can be important areas of community building (see Figure 3). Table 3 presents a summary of the type, number and area of spaces reported in the building's criteria document. Living spaces, including beds for 596 student residents, comprise approximately 81% of total square footage. These spaces include rooms (both suites and standard doubles), large lounges for each living-learning community, an array of informal lounges for studying, eating or socializing, and multiple small kitchens and laundry rooms. Living spaces also include the faculty apartment, where TB hosts regular community events, an apartment for a residential staff member and an apartment for visiting professionals.

Learning spaces comprise approximately 17% of the total assignable square footage. These include both

Table 3. Types, number and area of building spaces.

Space Type	Space	# of spaces	Area in ft ² (%)
Learning	Community space	8	6650 (30)
	Rehearsal and performance*	15	4600 (21)
	Teaching studios*	11	3865 (17)
	Makerspace*	11	7140 (32)
	<i>Learning spaces subtotal</i>	45	22,255 (100)
Living	Student residential space (incl. bathrooms)	287	97,275 (91)
	Study Lounges	6	2300 (2)
	LLC Lounges	3	3300 (3)
	Faculty/staff residential space	3	4160 (4)
	<i>Living spaces subtotal</i>	299	107,035 (100)
Support	Faculty/staff office space	7	1050 (35)
	Community support space	8	1954 (65)
	<i>Support spaces subtotal</i>	15	3004 (100)
Unassigned	Hallways, lobbies, etc.	NA	
	<i>Unassigned spaces subtotal</i>	NA	92,366
	TOTAL	359+	224,660

*Used routinely for formal instruction.

formal classrooms and informal study lounges. A community space with moveable furniture creates a central hub for the first floor from which other learning spaces radiate. Immediately south, a large makerspace containing wood and metal shops, and several tools for digital fabrication, also serves as a classroom for the school of visual arts. Southeast of the community hub, a rehearsal and performance space serves as a primary classroom for the school of performing arts, which runs various dance and music classes there. East of the community hub, two teaching studios and a seminar room serve as classrooms for the school of visual arts. The building's first-floor community spaces are open to the public 7 am to 8 pm on weekdays. After hours, and on weekends, the entire building is card access only.

Last, support space, including offices and mechanical rooms, comprise approximately 2% of the total assignable square footage. TB observed that most support spaces (including storage, housekeeping and mechanical) are available to a small set of university employees with specialized roles. Faculty/staff office space, however, does support regular and meaningful interaction between faculty, staff and students.

Shared indoor environment: resources

Resources can be defined at different scales. While the building itself is a valuable resource, as are the spaces within, the true value of these spaces is more fully realized once they are furnished. Here, furniture choices and layouts sought to create different types of affordances related to movement and pause.

In most cases, furniture affords pause. However, the nature of pause can vary creating different affordances.

Here, both the designers and administrators we interviewed distinguished between the academic and residential portions of the building and the broad types of activities that they sought to support. Structurally, both portions were designed to afford movement and pause, albeit in different ways. Some spaces were outfitted with furniture for longer pauses, to ‘hunker down and get some work done’ as one respondent noted, and some for shorter pauses, like ‘touching down’ briefly. For example, the presence of couches in the residential portion of the building is about ‘relaxing, slouching, hanging out’. Conversely, there are no couches in the academic portion of the building. Instead, the furniture, which is easily moveable, is more about supporting focused and/or collaborative work.

Last, the building’s production itself served as a key resource for one group, which viewed the project as an opportunity for professional development and graduate and undergraduate training, as noted above. This group, however, did not plan to routinely use the building once it was created. In this way, the building’s value as a resource ended when the design and construction processes were completed.

Shared indoor environment: symbols

Although much of our analysis focuses on the material and spatial dimensions of the building, our inductive coding process also surfaced the importance of symbolic elements. While often underemphasized in human–environment research, symbols, such as architectural inscriptions, building heraldry and graphic identities, were intentionally designed into the study building and routinely referenced by certain stakeholders. Administrators and graphic designers collaborated to produce heraldry, including six *values* (hope, artistry, friendship, creativity, learning and service) and three *outcomes* (knowledge, wellness and community), which are etched into the concrete gables of the building’s exterior. Also, they are used prominently in the building’s *story wall* (located near the central community space), in regular newsletters and communications, and on sweatshirts given out to students to incentivize attendance at community events, as TB routinely observes. Also, students, staff and faculty worked with a graphic designer to create a mark for the building itself. This symbol, which drew on themes of fire, water, scale, individuality, community, reflection and focus, is now used ubiquitously on websites, t-shirts and digital signage to represent the building and the community.

Respondents stressed that these symbols are intended to play an important role in shaping collective identity,

fostering community sentiment and reinforcing shared values. To the extent they do so, they may indirectly support the legitimacy and functioning of the building’s common property regime by promoting user buy-in, social cohesion and a shared sense of belonging.

Discussion

Buildings are not only physical structures, but socially produced environments that mediate access to space, resources and community. In this study, we examined the production and governance of a shared indoor environment, an academic-residential university building, to ask whether it functions as a common property regime (RQ1). Although common property theory was not used by the building’s designers or managers, our findings provide strong evidence that the building’s production process, spatial arrangements and governance structures, embody key characteristics of common property regimes. Our conceptual framework highlights these characteristics, both material and institutional, and offers a new approach for analysing how shared indoor environments are produced and governed (RQ2). In doing so, the study contributes to built environment scholarship by examining how design and governance intersect in shared spaces, and to geographic research by framing indoor environments as social–ecological systems produced and governed in common.

Our findings raise multiple issues worthy of discussion: (1) the production of this environment was influenced by factors across multiple scales; (2) the environment is a common pool resource, and its governance strongly resembles a common property regime; and (3) despite limitations, our study has implications for scholars and practitioners alike.

Producing a shared indoor environment

While many common property regimes focus on the governance of an existing natural resource, such as fisheries or rangelands (Bromley & Cernea, 1989), others involve the creation of shared resources through infrastructure and collective action, including irrigation systems (Ostrom & Gardner, 1993; Villamayor-Tomas, 2014) and cooperative farming (Grashuis, 2025), or community parks (Colding et al., 2013) and rainwater harvesting systems (Bollier & Helfrich, 2014). Built environment scholars have similarly examined how design processes, stakeholder engagement and institutional planning shape access to and use of shared spaces (Awan et al., 2013; Dovey, 2014). Our analysis showed that the production of the study building was

shaped by factors across scales from national housing trends to local space needs and embedded institutional mental models. Specifically, building planners faced a choice between two models of campus housing design: one focused on maximizing amenities and the other on co-curricular engagement. Choosing the latter marked a deliberate shift away from both traditional efficiency-driven models and the amenity oriented trend in favour of a design that prioritized intentional community building.

Crucially, respondents described the need to scaffold a shift in mental models within the institution to change how people perceived campus space and its possibilities. This was achieved through small, stepwise renovations to existing residence halls, alongside evaluations of local needs, specifically for arts and athletics. While common property theory was not invoked during this period of scaffolding or the building's final design, these processes reflect key principles of collective choice, negotiated access and shared governance, which are recognized in both commons scholarship and built environment research on participatory and institutional design (Manzini, 2015; Sanoff, 1999).

The result of these efforts is a building composed of diverse spatial and material resources that support the 'necessities of college life', (Blimling, 2014) including eating, sleeping, studying, wellness, inclusion, collaboration and creativity. Furthermore, the building supports the production of valuable social resources (Strange & Banning, 2015), which include both peer and intergenerational relationships, which may be scaffolded by formal structures like living-learning programs or classes, or supported informally simply by proximity and the serendipitous social collisions that occur within the building (Flack, 2024). The design process itself also served as a valuable resource for a group of instructors and students, enabling forms of experiential learning. In these ways, the building functions not just as a physical infrastructure, but as a socially produced environment shaped by design, use and governance, an idea supported by built environment scholars who highlight how spatial design influences social interaction and community formation (Hillier, 2008)

Building as commons

Our findings indicate that the study building is a common pool resource and a space governed in ways that resemble a common property regime, despite the absence of specific commons-based language among its designers and managers. Using Ostrom's (1990) design principals as a lens, we found evidence of six key attributes of commons governance.

Boundaries are clearly defined through spatial distinctions (e.g. residential vs academic vs living-learning spaces) and enforced with technologies like key cards. Rules for using and maintaining the resources are context specific and widely understood, formalized through a shared-use MOA, housing contracts and roommate agreements. Monitoring is carried out both formally and informally, with oversight distributed among staff, student leaders and residents embedded in the community. Graduated sanctions are evident in both the production phase (e.g. limiting stakeholder's access after repeated delays) and ongoing use, where individuals or groups face escalating consequences for misuse of shared spaces. Conflict resolution is accessible, with low-cost channels for mediation between users and/or officials. Finally, the building's governance is nested within a larger institutional framework, from resident advisors to university leadership.

Two principles of common property are less fully realized. Flexible choice arrangements are limited, as many rules around use are set at the university level. However, the novel design of the building has encouraged some user-driven adaptations such as students and faculty lobbying to adjust room-use policies. Similarly, users' rights to self-organize are not explicitly restricted, though evidence of such efforts is limited.

Instances of resource degradation, such as furniture being 'privatized' in private rooms, groups monopolizing common areas, or property damage, reflect minor tragedies of the commons. These issues underscore the need for ongoing monitoring and negotiated access but also highlight the value of the existing governance system, which includes policies and norms to prevent overuse and exclusion. Taken together, these findings show how a single university building can function as a commons-like system, with governance shaped by both spatial design and institutional rules.

Implications and limitations

This paper began with the premise that buildings are often important shared spaces, they contain valuable resources and they are actively produced. From this position, we examined the production and governance of a shared indoor environment and argued that it can be understood through the conceptual lens of common property regimes.

Our study offers an empirical and conceptual contribution. Empirically, it provides a rare, fine-grained look at how a building is designed and governed as a shared space. Conceptually, it demonstrates how buildings, especially those designed and governed as a shared resource, can be analysed as common pool resources,

with governance structures that resemble common property regimes. This offers a methodological opening for future research to treat buildings as social–ecological systems and examine them accordingly.

This approach contributes to both geography and built environment research. It deepens geographic understanding of human–environment relations by foregrounding indoor environments, spaces long overlooked in resource–governance debates. And it extends built environment scholarship by emphasizing not only how buildings are used, but how they are intentionally produced through design and governance strategies that shape future patterns of access, control and community.

Like all case studies, this research reflects the specificity of its context and carries several limitations. Our long-term, embedded role provided rich insight but may introduce interpretative bias, and the absence of formal interviews with student residents limits our understanding of user experience. Future research might address these gaps through comparative studies, deeper engagement with building users on the issue of common property or participatory approaches that centre diverse stakeholder perspectives.

Still, our findings also hold implications for practitioners. For designers and planners, the study shows how spatial arrangements and governance structures work together to foster (or constrain) inclusion, responsibility and collective wellbeing. We encourage practitioners to engage with commons thinking, not only to distribute access, but as a framework for building community and sustaining shared environments over time. For researchers, our framework offers a transferable lens for examining other buildings, and examining where patterns of commons governance emerge, or falter.

Finally, the building was produced as an intervention and an ongoing experiment; an intentional attempt to reimagine what a university residence hall can be. The process began by scaffolding new mental models and ended with a building designed to cultivate community through shared space. That shift took time, effort and conflict, but it offers a hopeful example of how buildings can be produced, socially and physically, for more equitable and sustainable futures.

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Author contributions

CRedit: **Timothy D. Baird**: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – original draft; **Elif Tural**: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Writing – review & editing; **David J. Kniola**: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Writing – review & editing; **Thomas J. Pingel**: Conceptualization, Funding acquisition, Investigation, Writing – review & editing; **Nicole Abaid**: Conceptualization, Funding acquisition, Writing – review & editing.

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Data availability statement

The data that support the findings of this study are not publicly available due to ethical considerations and institutional review board (IRB) restrictions. The dataset includes qualitative interview transcripts and internal institutional documents that contain identifiable or sensitive information. Summary materials or redacted excerpts may be available from the corresponding author upon reasonable request and pending appropriate ethical review.

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