LICHENG HUANG

Columbia M.S.AAD Graduation Portfolio
selected works from 2023-2024

Photo Anomaly: 86

CONTENT

01 DATA COMMUNITY GARDENING

Summer 2023
ARCH 4010
Location: New york, NY
Type: Educational

Design: Individual Work
Instructor: Uriel Fogué
lf2799@columbia.edu

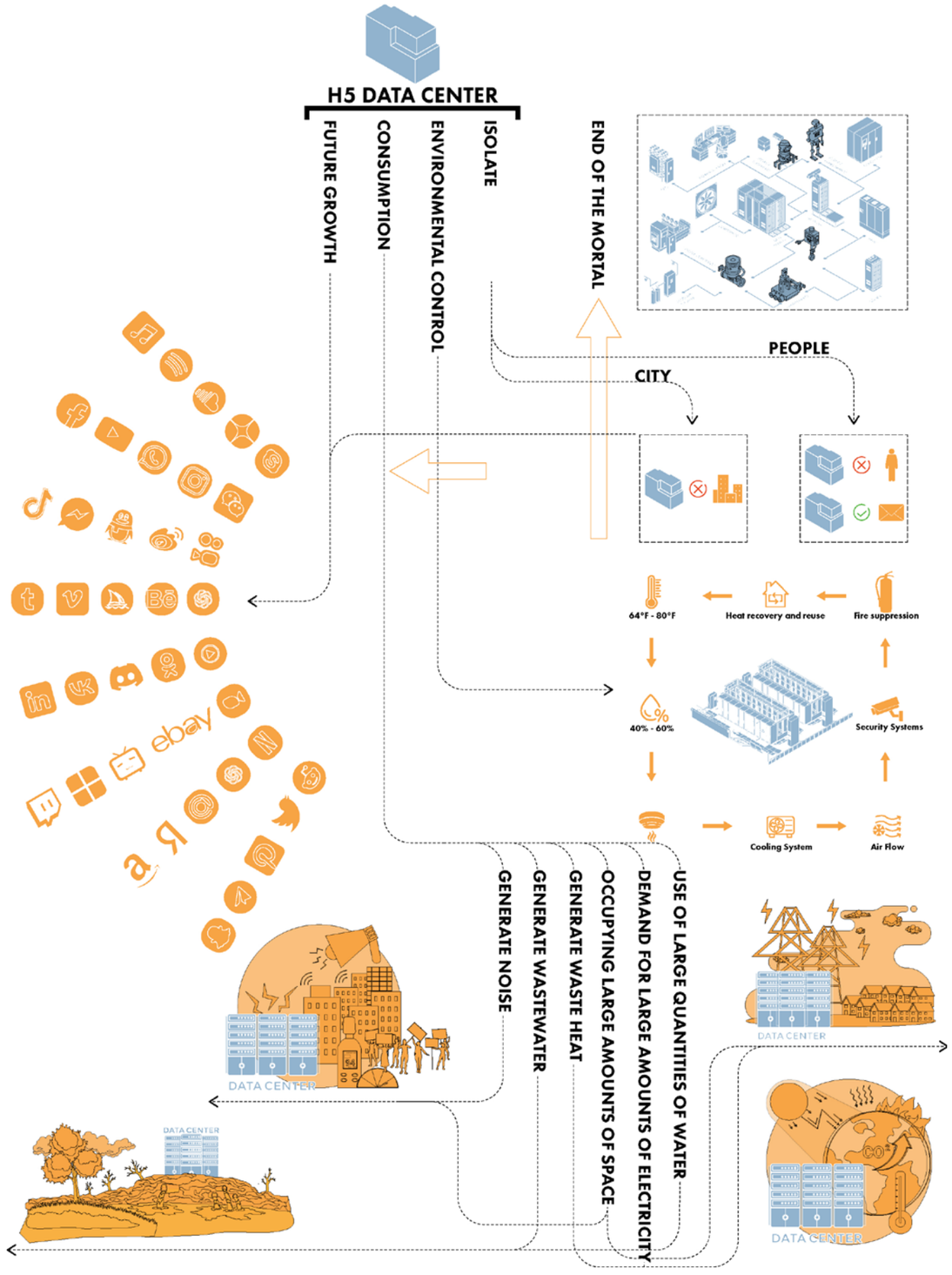
Atlas of Architecture for the End of the World: A Call for Rapid Transformation of Societies

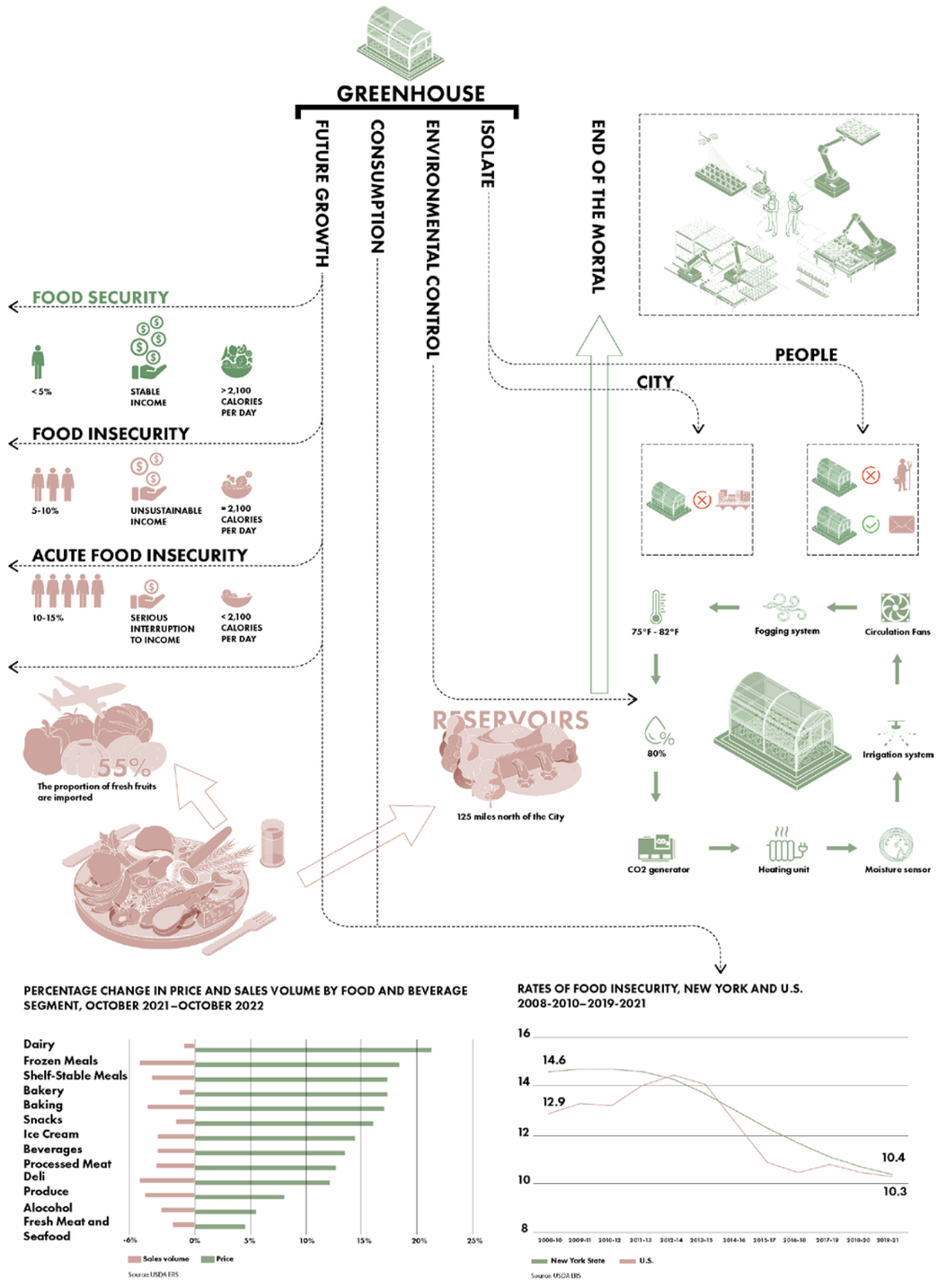
Data community gardening transforms city infrastructure, envisioning buildings that address both human needs and post-human challenges. **Data centers go beyond information repositories, becoming versatile hubs with a strong emphasis on sustainability and food security.**

The data center of the future is no longer limited to a singular purpose; it becomes **a pioneering multi-story facility that incorporates vertical agriculture through greenhouse technology.** By creatively repurposing the data center's cold air to cool the servers and subsequently channeling the hot exhaust air to cultivate vegetables.

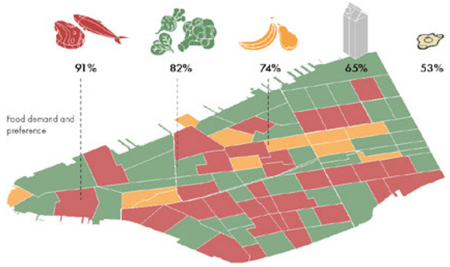
Data community gardening collaborates with local rescue organizations to combat food insecurity. The data center hosts interactive cooking demos and educational programs, empowering individuals with nutritious meal preparation and complimentary wellness initiatives.

Image: H5 Data Centers





The connections between data centers and greenhouses highlight opportunities for synergy in sustainability and technological advancement. By integrating renewable energy sources, leveraging data analytics for agricultural optimization, fostering smart infrastructure, and stimulating economic growth, these sectors can address societal challenges such as climate change and food security while promoting resilience and innovation.



120 lbs/ person / year
Approx demand: 4,656,000 lbs

31lbs/ person / year
Approx demand: 1,202,800 lbs

22 lbs/ person / year
Approx demand: 853,600 lbs

12.7 lbs/ person / year
Approx demand: 492,760 lbs

11.1 lbs/ person / year
Approx demand: 430,650 lbs

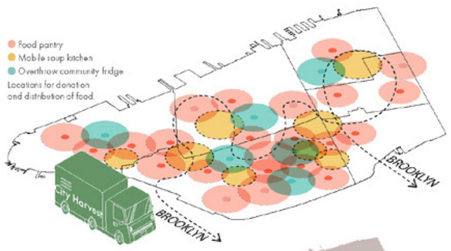
Source: "The Statistics Portal," Statista

GreenThumb's standard size lumber is 2"x10"x8'.

Cooking with Fresh Ingredients

Distributing Food with City Harvest

Source: greenthumb handbook



Bakery 2%

Prepared 4%

Meat 2%

Dairy 3%

Packaged 29%

Fruit & Vegetables 60%

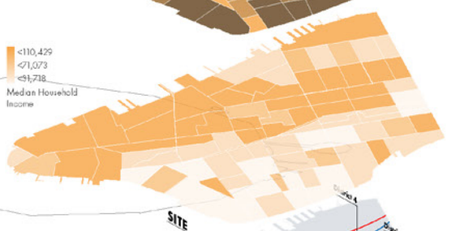
Source: Impact report by city harvest

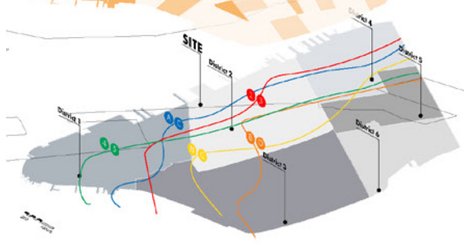
Children 5-17
29.7 %

Adults ages 18-59
41.7 %

Adults ages 60+
15.6%

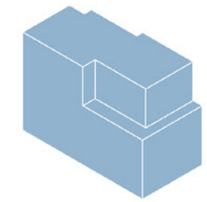
Source: Office of the NEW YORK STATE COMPTROLLER



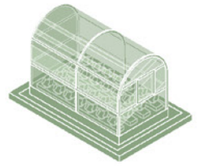


COOKING PROGRAM

COOKING PROGRAM

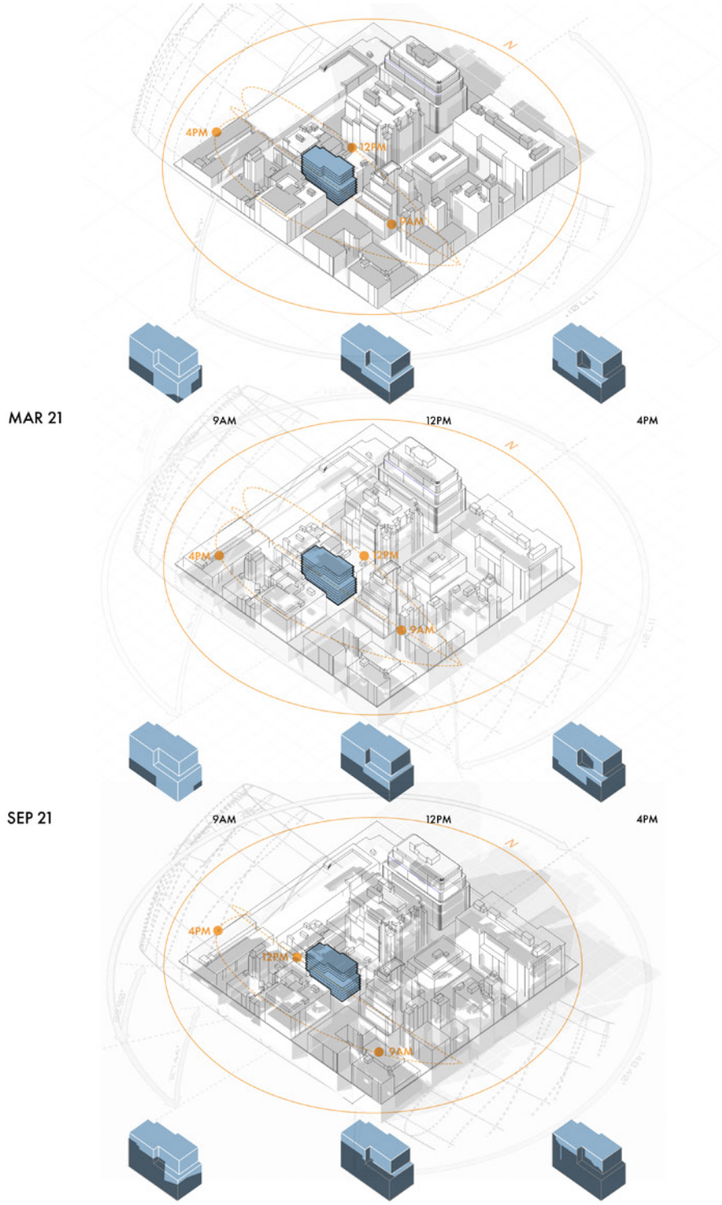


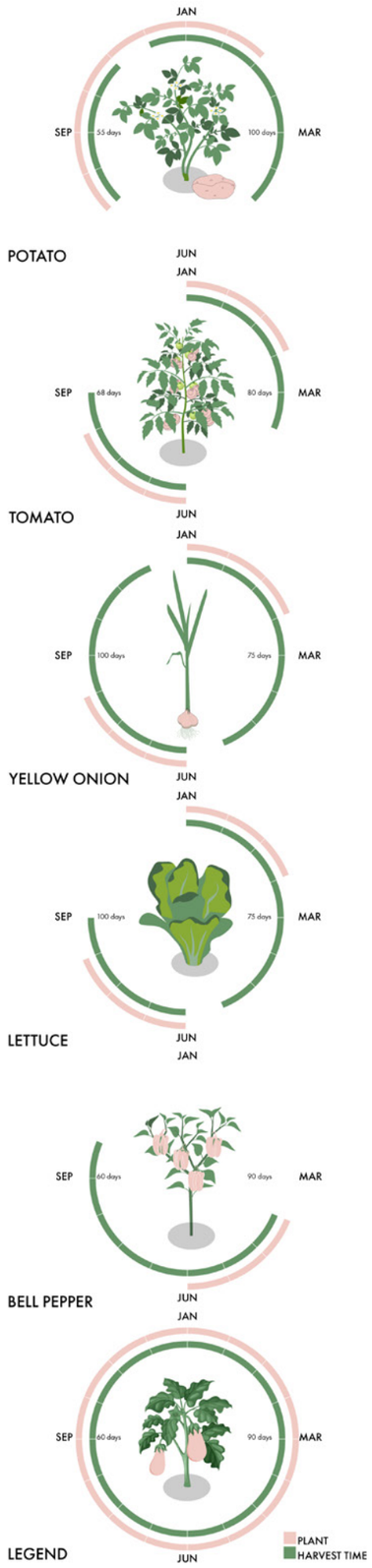
SITE: H5 DATA CENTER

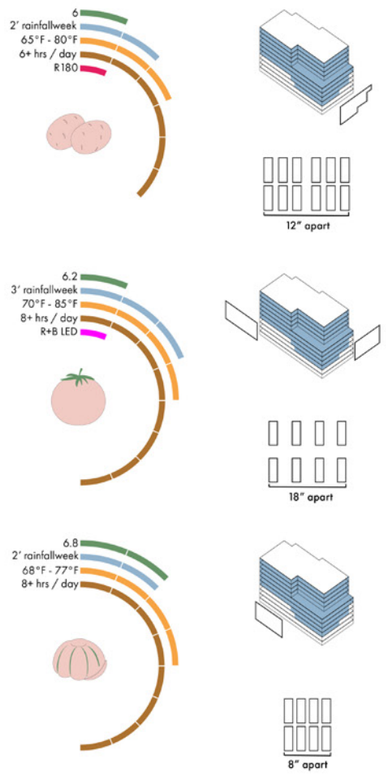


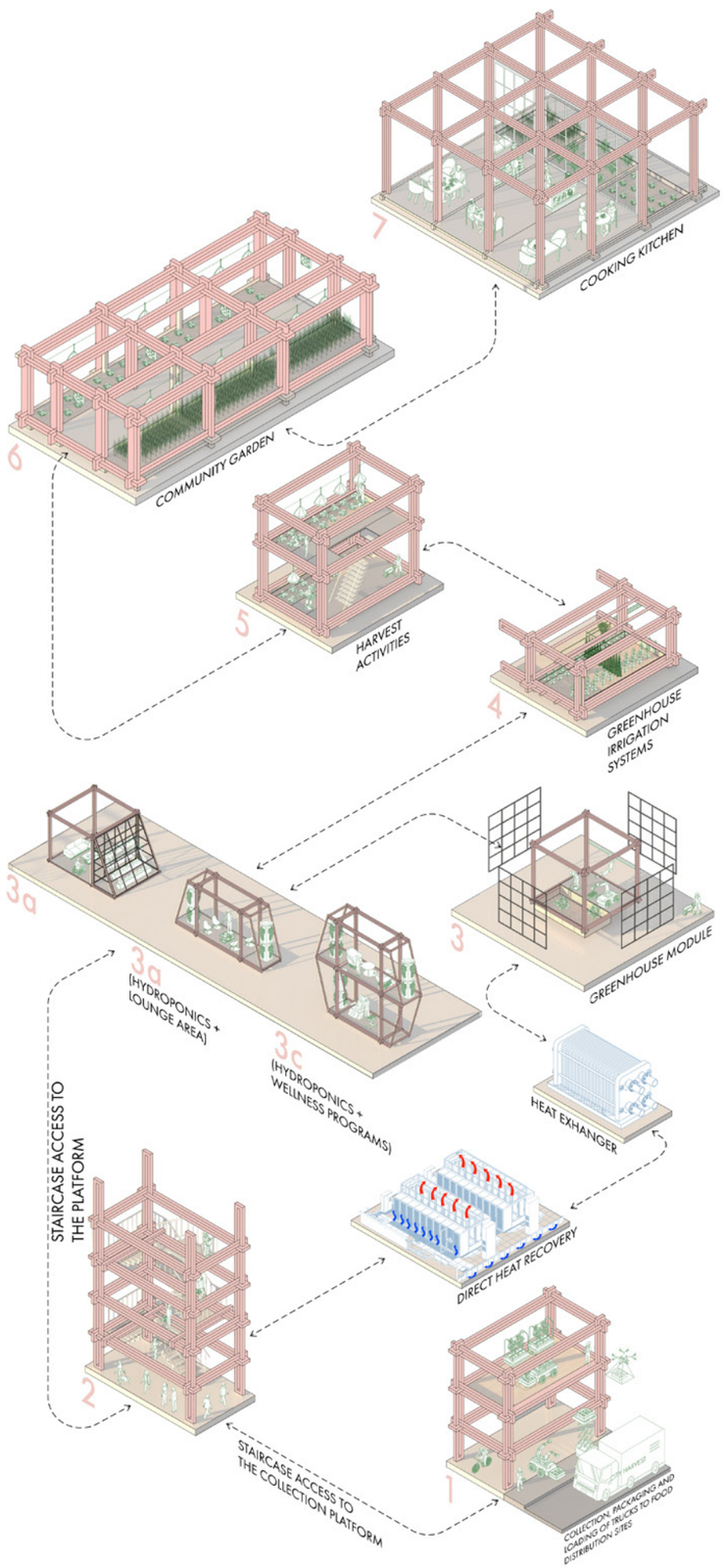
SUPPLY OF GREENS

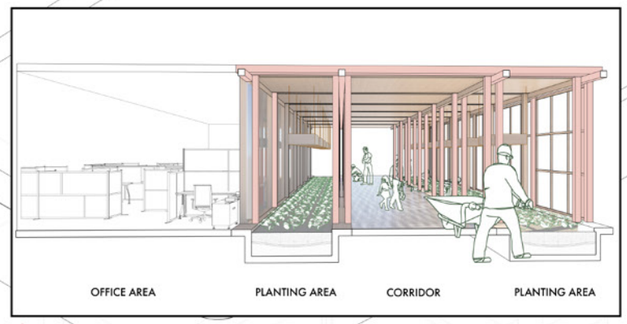
SUNLIGHT ANALYSIS FOR BUILDING PLANTING



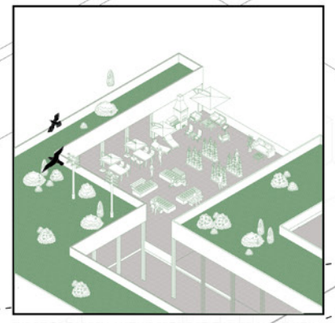




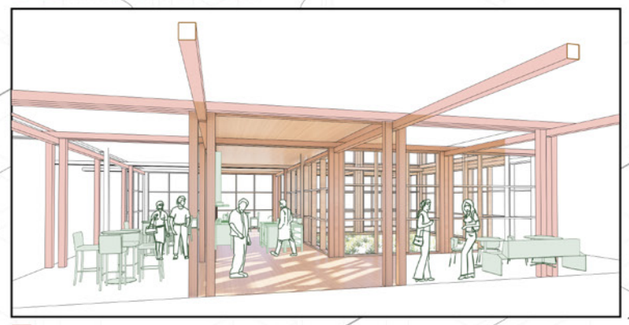




6 COMMUNITY GARDEN

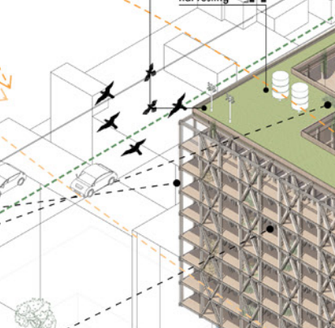


THE ROOF GARDEN ALLOWS PEOPLE TO GATHER AND ENJOY A QUIET RETREAT IN THE CENTER OF THE CITY.

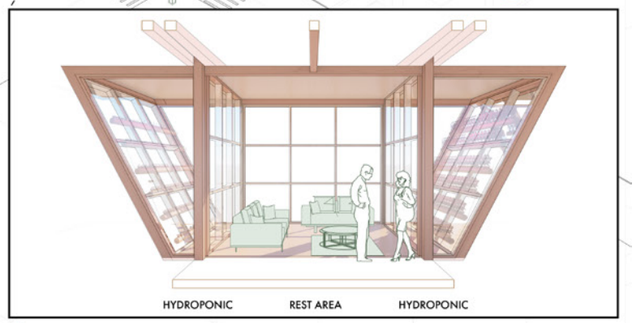


7 COOKING KITCHEN

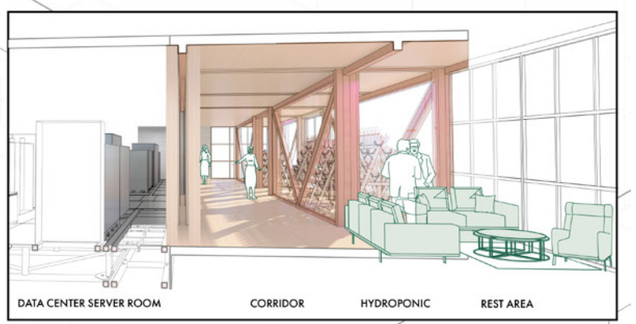
COLLABORATING WITH CITY HARVEST TO DISTRIBUTE PRODUCE TO THE COMMUNITY



HYDROPONICS MINIMIZES SPACE USAGE AND FOSTERS PROXIMITY BETWEEN PEOPLE AND PLANT PRODUCTION BY ENABLING CULTIVATION IN VARIOUS LOCATIONS.



3 MODULE 3C



3 MODULE 3C

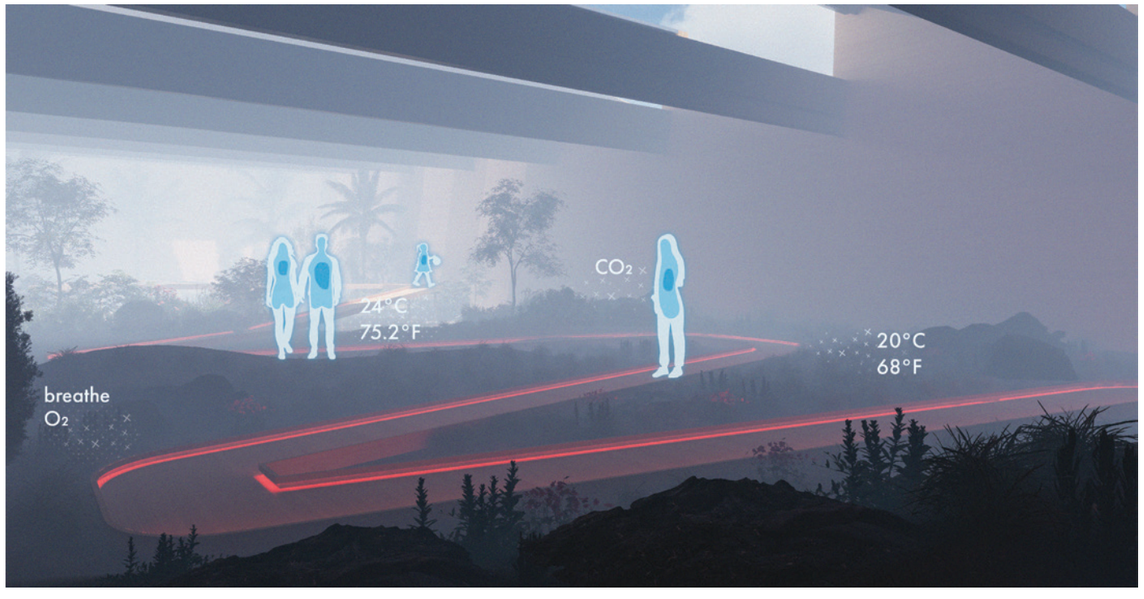
02 MOUNTAIN AVEN HOUSE

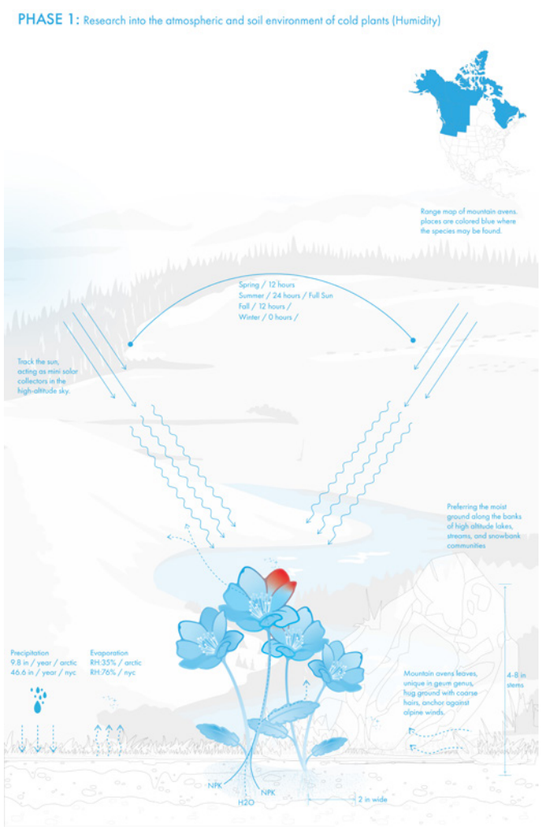
Fall 2023
ARCH A4105 -10
Location: New york, NY
Type: Educational & Cultural

Design: Individual Work
Instructor: Philippe Rahm (Philippe Rahm architectes)

Mariami Maghlakelidze
rahm@philipperahm.com
mm5755@columbia.edu

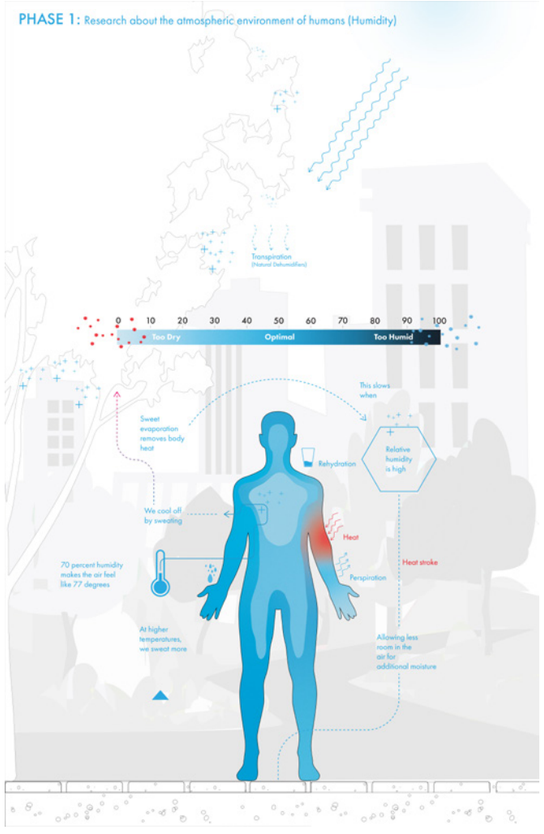
The studio focuses on addressing climate transformations due to global warming by combining theoretical understanding with practical solutions. It emphasizes reducing greenhouse gas emissions and enhancing habitability. Through architectural solutions, including precise thermal management and low-carbon strategies, the studio aims to create a **cold greenhouse in New York using renewable energies**. This approach integrates climatic and ecological considerations, emphasizing the construction of microclimates to combat the challenges posed by extreme temperatures.





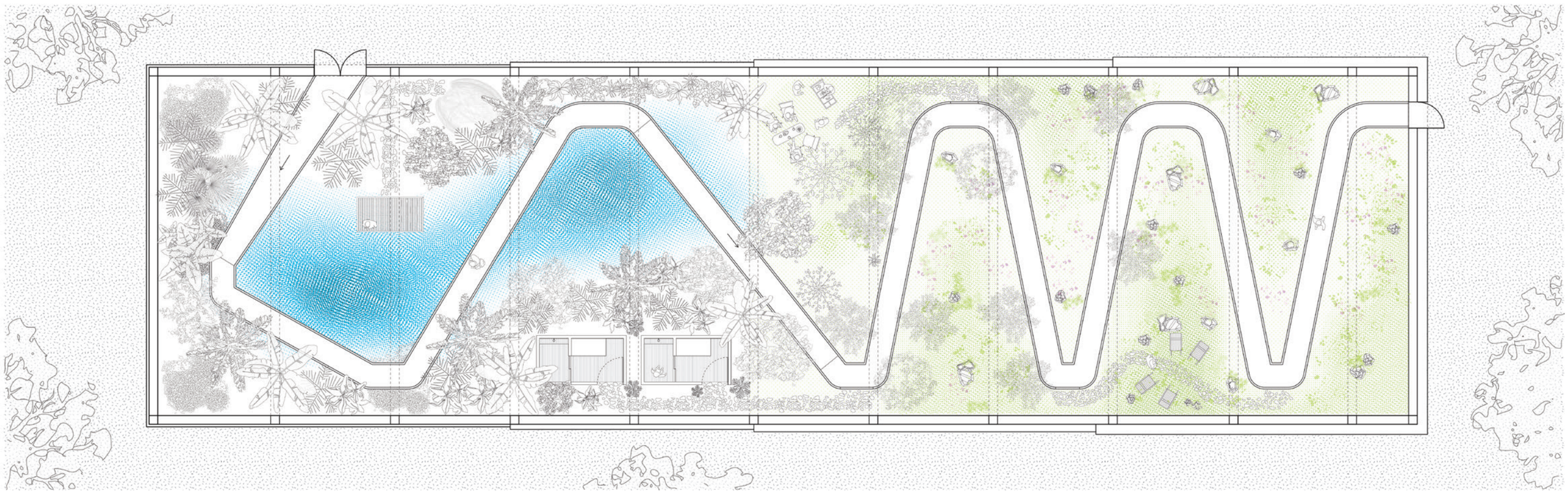
Adaptation of Arctic Plants: The Case of Mountain Avens

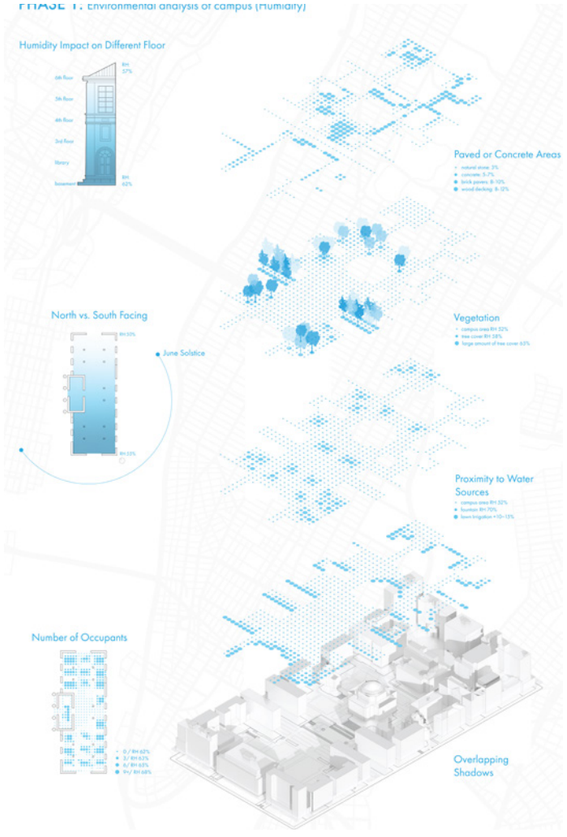
Mountain avens (Dryas octopetala) exemplifies how Arctic plants have adapted to cope with low humidity and minimize water loss through transpiration. Its small, leathery leaves with waxy coatings help reduce moisture loss, enabling it to thrive in cold, windy environments with limited water availability. However, climate change poses challenges to mountain avens and other Arctic plants by altering humidity levels and precipitation patterns, emphasizing the importance of conservation efforts to protect these unique ecosystems.



Understanding the Body's Response to Extreme Temperatures

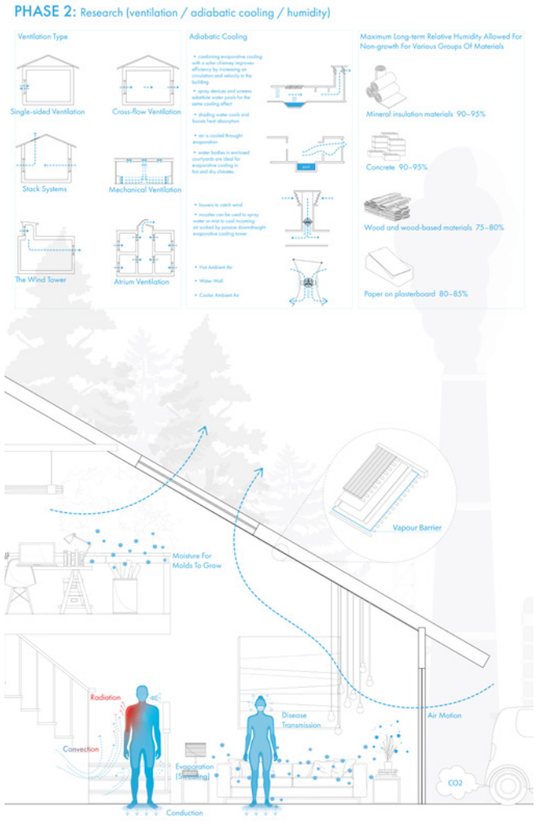
Extreme temperatures and humidity trigger physiological responses in the human body to regulate temperature and maintain internal balance. In high heat and humidity, sweating increases to cool the body, but efficiency decreases, leading to heat-related illnesses like heat exhaustion and heatstroke. In extreme cold, shivering and vasoconstriction help conserve heat, but prolonged exposure can result in hypothermia and frostbite. These conditions pose serious health risks, emphasizing the importance of staying hydrated, seeking shelter, and taking precautions to avoid heat or cold-related illnesses.





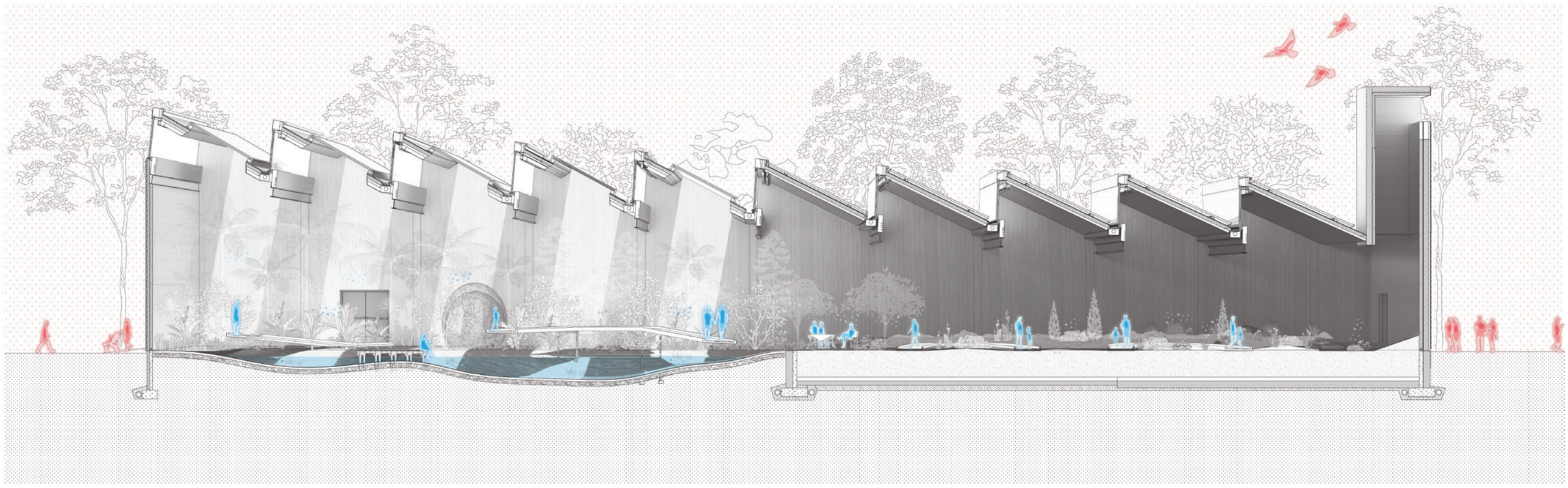
Microclimate Analysis for Sustainable Design

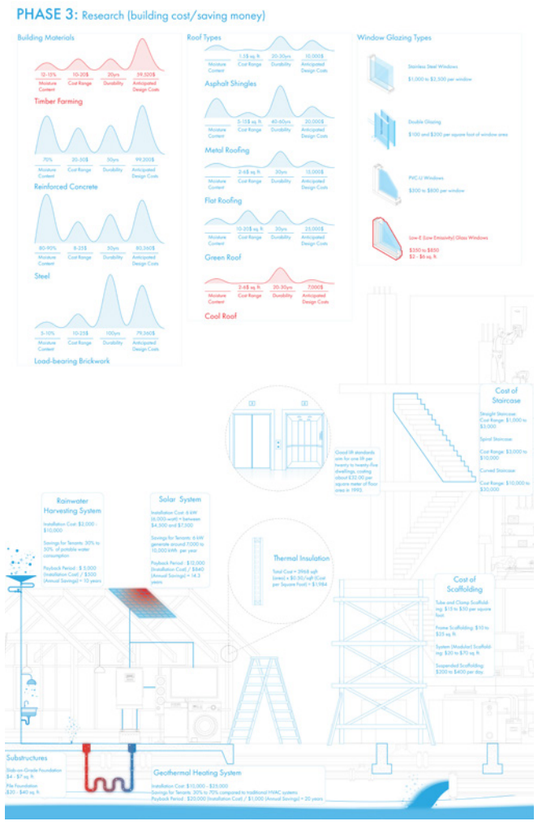
Analyzing a site at Columbia University involves assessing water vapor levels, tree shading, and pavement materials in relation to humidity and temperature. Understanding how these factors influence local microclimates is crucial for designing comfortable and sustainable environments. Trees provide shade and contribute to humidity regulation through transpiration, while pavement materials can affect heat absorption and retention. By considering these factors, planners can implement strategies to enhance thermal comfort and mitigate heat stress in urban environments.



Optimizing Indoor Comfort

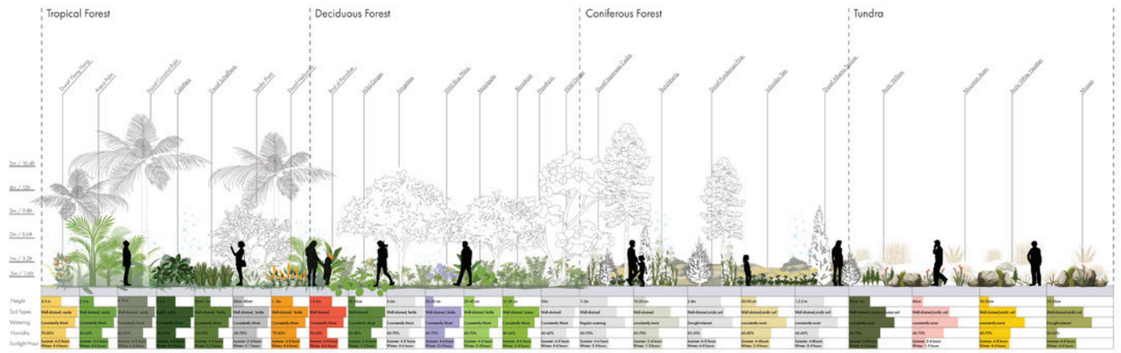
Ventilation in housing is crucial for maintaining indoor air quality and comfort. Excessive humidity fosters mold growth and respiratory issues, while low humidity causes discomfort and respiratory irritation. Natural ventilation utilizes passive airflow to cool down the house, employing techniques like cross-ventilation and stack ventilation. Architectural features such as operable windows and vents facilitate airflow, promoting a healthier and more comfortable indoor environment.





Balancing Cost and Sustainability

Architecture materials vary in cost and sustainability, with some offering energy-efficient properties. Sustainable options like recycled steel and reclaimed wood aim to minimize environmental impact. Certain materials, such as cool roofing and high-albedo surfaces, reflect sunlight, reducing heat absorption and lowering energy consumption in buildings.



Plant Diversity

Different types of planting contribute to temperature reduction through varying transpiration rates. Native trees, shrubs, and grasses have moderate to high transpiration rates, releasing water vapor into the air and providing shade, thus reducing surface temperatures.

03 PERMANENTLY in PROGRESS

Spring 2024
Advanced Studio VI
Location: Thailand
Type: Educational & Cultural

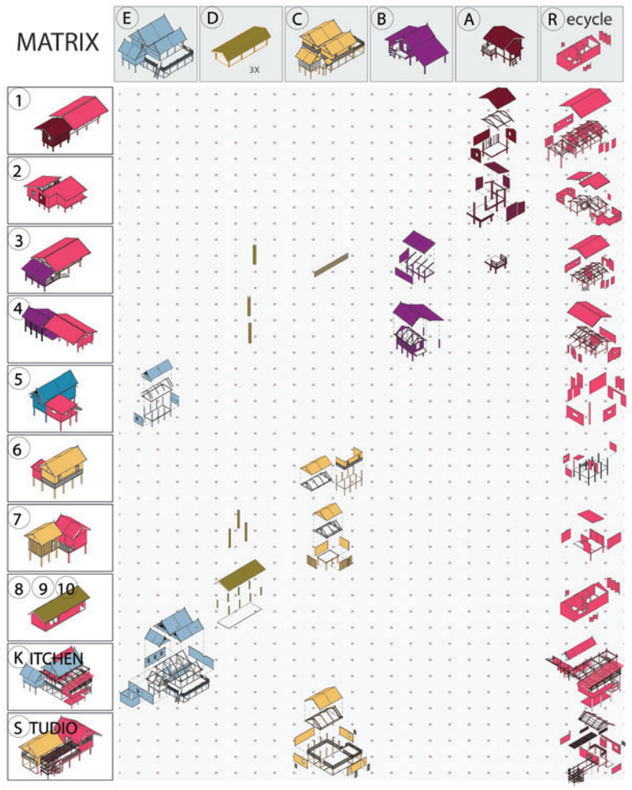
Instructor: Rachaporn Choochuey with Lucy Navarro
and Simran Raswant

The narrative explores the dynamic nature of architecture, acknowledging that buildings evolve over time rather than remaining static. It observes how buildings undergo transformations due to various factors such as material deterioration, societal changes, and economic shifts. This reality contrasts with the idealized perfection often associated with architectural design. The text also highlights the prevalence of modern construction methods, which prioritize speed and cost-efficiency but may neglect long-term durability.

In response to these challenges, the concept proposes embracing impermanence and transformation in architecture. It draws inspiration from vernacular practices, particularly in Southeast Asia, where buildings are designed to adapt to natural and social forces. The narrative emphasizes the importance of using durable materials and regular maintenance to prolong a building's lifespan.

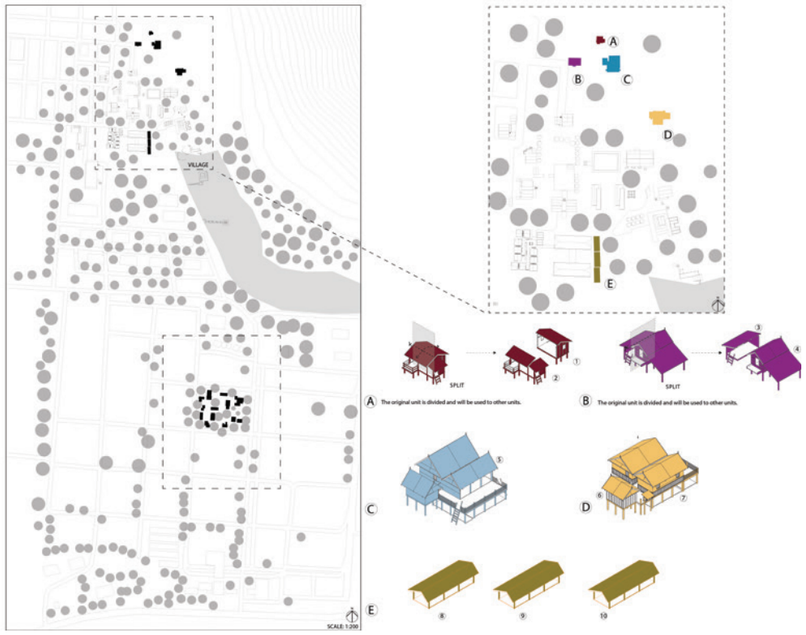
Furthermore, the concept envisions repurposing existing structures and upcycling materials to create new spaces that respond to changing needs and conditions. **By reimagining idle structures and incorporating sustainable practices, the project aims to breathe new life into architectural spaces, reflecting the dynamic nature of human habitation**.

The narrative sets the stage for a studio project focused on exploring alternative models of collective living spaces capable of adapting to climate change and social uncertainties. It proposes using the artist residence at the Jim Thompson Art Center as a design brief to experiment with materiality and tectonic design. Through research, collaboration, and hands-on experimentation, the studio seeks to develop innovative solutions that embrace impermanence and transformation in architecture.



Resourceful Living: Repurposing Homes and Spaces

During our trip, we saw locals creatively using materials to adapt their homes. They efficiently meet their needs and upcycle materials like doors and windows. We also found unused traditional houses on farms, inspiring us to repurpose them.



Revitalizing Unused Spaces

On-site, we discovered five existing structures, each distinguished by a different color, situated on the village's periphery, largely unused. Seeing potential, we proposed a plan to repurpose these structures. Our concept involves integrating these five existing structures with upcycled materials to create 12 distinct spaces, including kitchens, studios, and ten residences. For instance, Houses A and B are divided into four residences each, utilizing both outdoor and indoor areas effectively

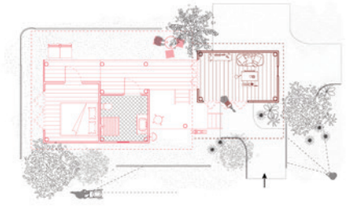
ORIGINAL

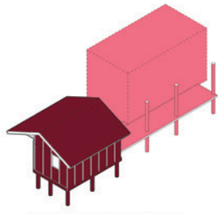
DESIGN PROCESS

PROPOSAL

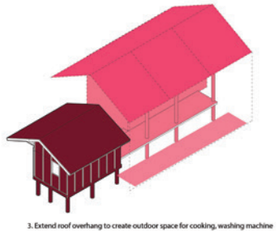
1 RESIDENT

1.Existing program severe as livingroom and work studio

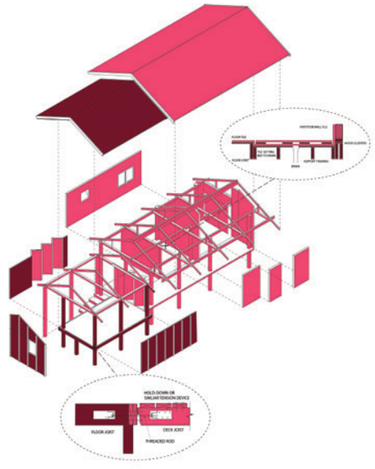




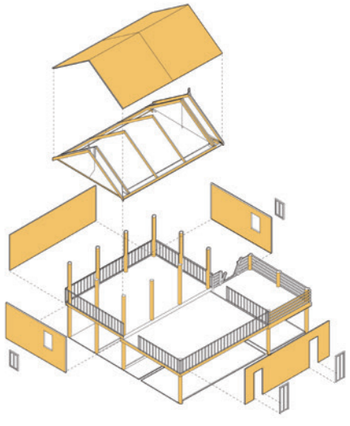
2. Add extra footprint for bedroom and restroom.



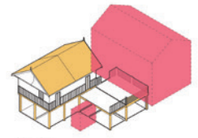
3. Extend roof overhang to create outdoor space for cooking, washing machine



S TUDIO

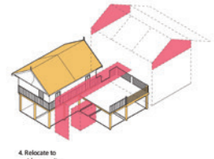


1.Original

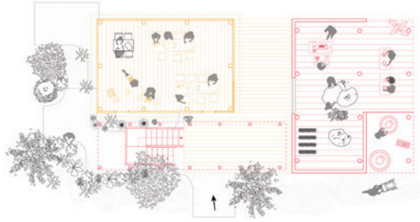


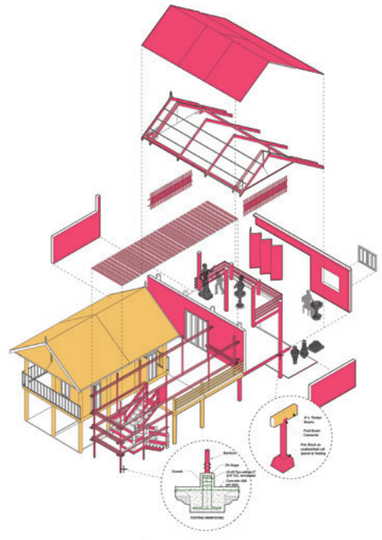
2. Relocate to residency unit.

3. Relocate to residency unit.



4. Relocate to residency unit.





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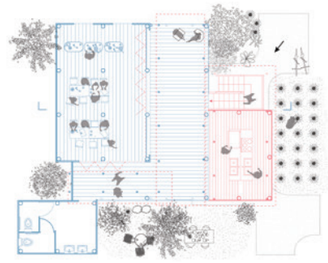
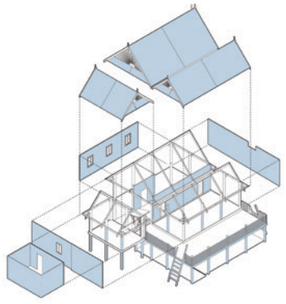
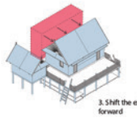
1.Original

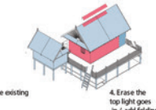
2. Relocate to residency unit.



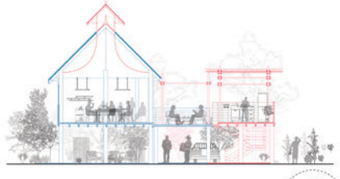




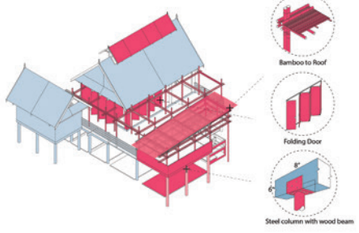
3. Shift the existing forward



4. Erase the top light goes in / add folding door.



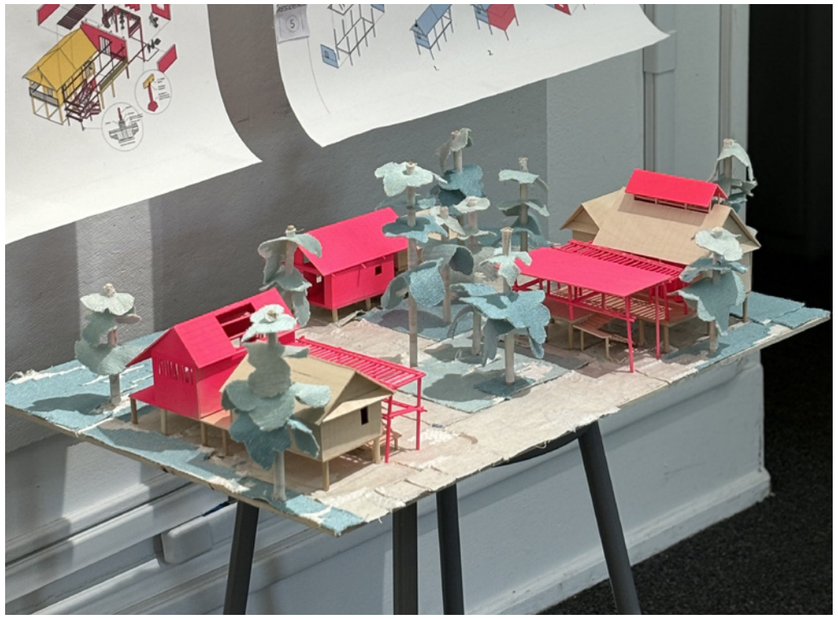
5. Adding bamboo canopy and kitchen program



Bamboo to Roof

Folding Door

Steel column with wood beam



04 BODIES AND PUBLIC SPACE

Fall 2023
Type: History

Instructor: Bryony Roberts

This course critically examines the nexus of social justice movements and the built environment, underscoring the pivotal role of individual experiences in confronting systemic oppression and striving for liberation. It interrogates prevailing design paradigms for their oversight of diverse bodily realities, advocating instead for the integration of insights drawn from intersectional feminism, critical race theory, queer theory, and disability justice into architectural methodologies. By delving into theoretical frameworks and hands-on design projects, particularly focusing on public spaces, the course seeks to broaden perspectives on inclusive design and challenge entrenched norms within architecture, historic preservation, urban design, and planning.

Through a series of engaging exchanges between theoretical texts and practical applications, participants will explore how considerations of diverse embodiment can inform innovative approaches to design, planning, and preservation in the public realm. Emphasizing the vital role of public spaces in fostering civic health, the course highlights the need to create inclusive and accessible environments that cater to a wide spectrum of lived experiences. By juxtaposing various theoretical lenses with real-world case studies, students will gain valuable insights into how to reimagine urban landscapes and architectural structures to better reflect and accommodate the rich diversity of human existence.

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The Complexities of Disability, Architecture, and Cultural Perspectives

In the world of talking about buildings and disability, two interesting articles, "The Architecture of Disability" by Gissen David and "Embodiment" by Abby Wilkerson, want us to think more about how we see disability in buildings. Both essays say that we should look beyond just making buildings physically accessible. They want us to think about broader challenges that people with disabilities face in places where they live and work. Gissen talks about "the spatial politics of impairment." [1] He thinks that when we design buildings, we should think about more than just making them easy to get into. Gissen says that even though we've gotten better at making spaces accessible, there are still problems for people with disabilities. He thinks that sometimes, without meaning to, buildings can make it hard for people with disabilities to be part of things. Gissen believes that our focus on making things accessible sometimes only looks at the physical side of disability and misses the bigger challenges. Wilkerson's essay, "Embodiment," explores changes in how we think about disabilities. She wants us to see disability as part of the whole human experience. Wilkerson says we should not separate our minds from our bodies when we talk about disability. She believes that disability can teach us new things about being human. According to her, understanding disability can change the way we see family connections and even how the world works economically. Wilkerson thinks that disability perspectives can offer important ideas to challenge how we usually think in the Western world. Although both essays share the common objective of prompting a reevaluation of disability, I aim to engage with each author from three distinct perspectives: the inherent tension with universal design, limited cultural and global perspectives and the potential for oversimplification.

In exploring the transformative role of disabled individuals in architecture, the article "Architecture of Disability" by David Gissen emphasizes the potential of crip technoscience but neglects a crucial perspective—the economic challenges hindering the seamless integration of these practices, particularly in resource-limited settings. This oversight is underscored by a report from the World Health Organization and the United Nations Children's Fund, revealing that over 2.5 billion people globally need assistive products like wheelchairs, hearing aids, or communication apps. Alarmingly, nearly 1 billion of them lack access, especially in low- and middle-income countries, where availability meets only 3 percent of the need. [2] This stark reality amplifies the economic disparities that impede the widespread implementation of transformative designs in

[1] David, "introduction," 8
[2] WHO, 2022

architecture, hindering progress toward truly inclusive spaces. Similarly, the focus on the transformative role of disabled individuals in technoscientific and activist realms, as advocated in recent disability studies, often overlooks economic considerations. [3] The celebration of "embodiment" as a corrective to historical mistreatment tends to neglect the financial constraints that limit access to cutting-edge assistive technologies. In economically disadvantaged communities, where the celebration of embodiment meets tangible challenges, advanced mobility devices and sensory aids remain financially out of reach for many disabled individuals, challenging the feasibility of implementing a comprehensive crip technoscience approach. This economic challenge is further exemplified by the difficulties faced by disabled activists in low-income countries, where even basic healthcare services are a luxury. The economic disparities directly impact the ability to engage in technoscientific advancements or participate in activist endeavors, as highlighted in "Disability and Global Development" by Karen Soldatic and Shaun Grech. [4] Disabled individuals in these regions face economic challenges that intersect with their struggles, highlighting the hindrance posed by the tangible economic gap. This gap becomes a barrier, preventing the full realization of inclusive practices in both architectural and technoscientific contexts. To conclude, the undeniable transformative potential of disabled individuals in architecture and technoscience is acknowledged. However, the economic challenges outlined in the mentioned articles and supported by a real-world example from the World Health Organization and UNICEF emphasize the need for a more comprehensive approach. Addressing economic disparities is crucial to achieving the inclusive vision advocated by disability studies, ensuring that crip technoscience practices can genuinely impact the creation of accessible and transformative spaces for everyone.

Moreover, in the ongoing conversation about making architecture more accessible, conflicting viewpoints arise, shedding light on the complex relationship between disruption and inclusivity. David Gissen argues for a broader approach to the spatial politics of impairment, questioning the effectiveness of accessible design and its alignment with functionalist perspectives. In contrast, Abby Wilkerson advocates for a disability studies approach, highlighting the dynamic nature of identity and potential conflicts with universal design principles. However, a closer look at concrete examples, such as the impact of the Americans with Disabilities Act (ADA) and universally designed features like ramps and elevators, reveals a nuanced understanding of disruption and inclusivity. [5] Gissen's skepticism about the effectiveness of accessible design contrasts with the success of the ADA. Enacted in 1990, the ADA is a crucial civil rights law that sets quality standards for individuals with disabilities. Arising from activism

[3] Wilkerson, "Embodiment,"
[4] Soldatic & Grech, 2016
[5] "ADA Inspections Nationwide, LLC — ADA Compliancy."

within the disabled community, this legislation has transformed urban environments by introducing universally designed solutions. Despite Gissen's concerns about potential exclusion through disruptive approaches, the ADA's emphasis on standardization and inclusivity has enhanced usability for a wide range of people. Ramps and elevators, mandated by the ADA, not only cater to wheelchair users but also benefit individuals with various mobility aids, parents with strollers, and those with temporary injuries.

Wilkerson's call for a crip technoscience approach to embodiment adds complexity and challenges traditional norms. However, when compared to universally designed features like ramps and elevators, the tension between disruption and inclusivity becomes evident. While Wilkerson acknowledges the fluid boundaries of disability narratives, the standardized design of universally accessible features ensures simplicity and inclusivity. The tension arises when disruption risks overshadowing the practical achievements of standardized, universally designed solutions. For instance, a person with a mobility impairment may rely on a universally designed ramp as a reliable and standardized solution across various environments. In conclusion, navigating the interplay between disruption and inclusivity in accessible design requires a balanced approach. Gissen's critique of functionalist perspectives needs reconciliation with the tangible successes of initiatives like the ADA, emphasizing standardization and inclusivity. Wilkerson's emphasis on embracing complexity should be considered alongside the potential drawbacks of disrupting universal design principles. The example of accessible ramps and elevators exemplifies the delicate balance needed to ensure inclusivity while acknowledging the diverse needs of individuals with disabilities. A nuanced understanding of disruption and inclusivity allows for the ongoing evolution of a built environment that accommodates the diverse experiences and identities of its users.

Moreover, within the conversation on accessibility in architecture and disability studies, the perspectives shared by David Gissen and Abby Wilkerson offer valuable insights, yet they prompt a careful examination of limited cultural and global viewpoints. Gissen's challenge to the predominant emphasis on architectural accessibility raises essential questions about the potential reinforcement of established definitions of disability. While his critique highlights the drawbacks of a functionalist framework, it's crucial to acknowledge the global importance of accessible design. Limited cultural and global perspectives must be recognized to accommodate diverse needs and standards across societies. Gissen questions, "Why isn't the struggle for accessible architecture enough? After all, buildings, landscapes, and urban spaces provide 'access' when disabled people can navigate within them and utilize them more easily". [6] For example, in some asian cultures, traditional architectural structures pose accessibility challenges, and organizations like Accessible Japan in Kyoto address this by advocating for universal

[6] David, "introduction," 9

design principles. [7] They collaborate to transform historical barriers into accessible routes, working with authorities to enhance overall accessibility.

On the other hand, Abby Wilkerson's emphasis on the positive aspects of embodiment within disability studies suggests a departure from traditional medical-focused scholarship. However, it's crucial to recognize the potential limitations of this perspective in addressing diverse experiences and challenges faced by disabled individuals globally. Wilkerson's focus on embodiment may not fully capture the complexity of disability experiences in societies where disability is stigmatized and access to resources is limited. According to Wilkerson, "Disability narratives involving chronic illness often rely on embodiment to establish a sense of identity 'predicated on fluid boundaries'. [8] For instance, in certain cultures, disability narratives may perpetuate stigma, viewing disability as a consequence of past transgressions or a familial burden, leading to social isolation. The emphasis on embodiment might not adequately address the discrimination and limited access to essential services faced by disabled individuals in various global regions. In conclusion, the perspectives presented by Gissen and Wilkerson significantly contribute to the discourse on accessibility and embodiment in disability studies. However, achieving an inclusive understanding of disability requires a lens that considers limited cultural and global perspectives, ensuring that solutions and narratives resonate with the diverse cultural and global experiences of disabled individuals.

In conclusion, the insights offered by David Gissen and Abby Wilkerson propel us into a realm where accessibility extends beyond physical design. Both authors advocate for a reevaluation of our approach to disability in the built environment, encouraging us to transcend the limitations of conventional accessibility paradigms. Gissen's exploration of the spatial politics of impairment prompts a critical examination of the potential pitfalls in our current understanding of accessible design. His call to look beyond mere physical access challenges us to consider the broader implications of our architectural choices on the inclusivity and participation of people with disabilities. Wilkerson, in turn, invites us to embrace a more holistic perspective on disability, urging a departure from traditional medical models. Her emphasis on embodiment and the intricate relationship between mind and body challenges us to recognize disability as an integral part of the human experience. By acknowledging the complex interplay of cultural, social, and economic factors, Wilkerson broadens the narrative around disability, offering a lens through which we can better understand the diverse challenges faced by individuals globally. However, as we navigate the evolving landscape of accessible design and disability studies, we must confront the tension between disruption and

[7] Jackson, Exploring Accessible Touring in Kyoto
[8] Wilkerson, "Embodiment," 15

inclusivity. The success of universally designed features like ramps and elevators, mandated by legislations such as the Americans with Disabilities Act, underscores the practical achievements of standardized solutions. While Gissen's skepticism about disruption poses valuable questions, the tangible benefits of such universally accessible features cannot be ignored. This tension necessitates a balanced approach, one that acknowledges the need for innovation while appreciating the reliability and inclusivity offered by standardized design principles. Furthermore, the essays compel us to confront the reality of limited cultural and global perspectives in the discourse on disability. Gissen's challenge to established definitions prompts us to consider the varied cultural interpretations of accessibility, as exemplified by organizations like Accessible Japan. Wilkerson's celebration of embodiment, while transformative, must be scrutinized for its applicability across diverse cultural contexts. Disability narratives, deeply rooted in cultural perceptions, may present challenges that go beyond the scope of embodiment-focused analyses. The convergence of Gissen's spatial politics and Wilkerson's embodiment opens a gateway to a more comprehensive understanding of disability in architecture. However, the tension between disruption and inclusivity, as well as the recognition of limited cultural and global perspectives, necessitate a nuanced and adaptable approach. By embracing this complexity, we can forge a path toward truly inclusive, accessible, and culturally sensitive environments that honor the diverse experiences of individuals with disabilities worldwide. The journey towards inclusivity in architecture requires continual introspection, collaboration, and a commitment to navigating the intricate intersections of theory, practice, and lived experiences.

Sources

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