Collaborative Systemic Design for Health towards a Post-pandemic Reassessment of Cosmopolitanism

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Covid-19 has quashed cosmopolitan worldviews that took a globalized economy and unlimited mobility for granted. The pandemic focused our attention – albeit temporarily – on local time and place, away from the global challenges of rapid urbanization, environmental degradation, and climate change. To address these challenges, architectural education must adopt transdisciplinary modes of inquiry that integrate discipline and profession, theory and practice as well as the required ethical dimension that reaffirms the discipline's societal relevance.

This paper documents this pedagogical shift by reporting on the first international multidisciplinary summer school on systemic design for health which the KU Leuven Faculty of Architecture (Belgium) and the Thammasat Design School (Thailand) organized in collaboration with Téchne, the technical science for health network set up by the World Health Organization (WHO). This initiative examined the potential of systems thinking and systemic design for improving ventilation, temperature, humidity, and daylighting for the purposes of infection prevention and control (IPC) in the context of mainland South-East Asia.

It introduced participants to three distinct study areas in an inner-city built-up area, a peri-urban informal settlement, and a rural hamlet respectively. The working format included a first week where teams conducted successive phases of systems thinking leading to the formulation of bespoke leverage hypotheses. The second week articulated these leverage hypotheses into the parallel production of a systemic matrix and a building typology design.

This experiment thus introduced 'system-wise' approaches into architectural and design education demonstrating the alignment of systemic design with the aims of the WHO Téchne network in delivering safer, healthier, equitable and sustainable healthcare systems, contributing to the post-pandemic reassessment of cosmopolitanism. Following the success of this experiment, a two-year iterative process has been set to elaborate a widely applicable graphic checklist and design brief for primary health care centers in flood-prone areas in South-East Asia.

INTRODUCTION

Advances in information and communication technologies over the past decades have projected a cosmopolitan worldview in which a globalized economy was taken for granted and mobility accepted to be the norm rather than the exception. The Covid-19 pandemic substantially disturbed that perception; providing a stern reminder that while everyone is local, not everyone is global.

The rapid spread of the virus led to strict measures including travel restrictions, quarantine, lockdowns and social distancing which debilitated the movement of people, information, and commodities on both global and local scales. Flows of migration froze or even reversed, powerhouses in global cities emptied, streets became deserted for long periods of time, whilst public life came to a standstill.[1] As isolation measures forced people to withdraw to their homes, many shifted to online platforms for work, education, and social life. While digital or virtual escape routes remained open to many, circumstantial physical realities and infrastructural conditions prevented those living in dense, underserviced areas from following basic hygiene measures, let alone abide by social distancing instructions.[2] Medical scientists developed effective vaccines at record speed which were mass-produced by the pharmaceutical industry, and governments worldwide administered through unprecedented vaccination programs. However, vaccine access was delayed for entire populations due to pricing and distribution issues, particularly in the Global South, further exacerbating existing inequalities.[3]

Nevertheless, the pandemic did more than accentuate the disparate access to healthcare. It focused our attention – albeit temporarily – on local time and place, away from the global challenges of rapid urbanization, environmental degradation, and climate change. As the here and now of everyday life gained prominence, the tension field between the local and the global intensified, adding on to the challenging socio-economic as well as spatial implications of uneven spatial development, the growth of global cities, the heightening of cultural and ethnic heterogeneity and the multiplication of cosmopolitan experiences.

As highlighted by UN-Habitat, the occurrence of social, economic, and environmental crises is likely to be exacerbated, with the UN projecting that by 2050 68% of the world's population will be living in urban areas, up from 54% in 2016.[4] In a rapidly urbanizing world, the pandemic showed how it intimately affected many aspects of everyday life, indicating how cities thrive on a complex and highly connected as well as interdependent web of systems. This involves modes of inquiry that integrate discipline and profession, theory and practice, as well as the ethical dimension necessary to reaffirm the discipline's relevance to society.

Architecture, being a discipline rooted in the 'lived experience' of everyday life, now faces the formidable challenge to reconcile these multiple cosmopolitanisms with the specificity of place. The aforementioned global challenges, both existing and emerging, cannot be addressed in isolation, but rather architectural education should prepare students to think in a complex systemic and interdisciplinary approach. Referring to Meadows, a system is defined as "an interconnected set of elements that is coherently organized in a way that achieves something."[5] To give an example, a health system, according to the World Health Organization, consists of all infrastructures, organizations, people, and actions whose main intention is to promote, restore, or maintain health.[6] Systems thinking allows us to understand the purpose of a particular system, providing a holistic way to identify and analyze a system's constituent elements, its interconnections between these elements, and how the system operates as an interactive component of even larger systems.[7]

Hence, to address this need for a pedagogical method and approach, the authors of this paper looked into the potential of systems thinking and systemic design, a widely accepted approach to deal with complex issues in a holistic, innovative, and collaborative way. They coordinated the first international multidisciplinary summer school on systemic design for health, an experiment that the KU Leuven Faculty of Architecture (Belgium) and the Thammasat Design School (Thailand) organized in collaboration with Téchne, the technical science for health network recently established by the World Health Organization (WHO).

WHO Téchne contributed to the pandemic response on all levels, providing technical assistance to member states in all WHO Regions by making health settings and structures safer, reducing the risk of hospital-acquired infections by improving environmental and engineering aspects of health facilities.[8] Initially focused on COVID-19, the network's operational scope has since expanded to other infectious diseases and broader health issues including primary healthcare as well as mass casualty events. Téchne engaged in this summer school experiment as part of its long-term aims for national and international capacity building through multidisciplinary and multicultural workshops.

1. SYSTEMIC DESIGN FOR HEALTH - SUMMER SCHOOL EXPERIMENT

Gathering a multidisciplinary group of 23 under-, graduate and post-graduate students from Belgium, Cambodia, Myanmar, Thailand, and Vietnam, this initiative sought to improve ventilation, temperature, humidity, and daylighting for the purposes of infection prevention and control (IPC) in the context of mainland South-East Asia. The general objective was to develop ideas for a multiple disease treatment center that could provide not only isolation units but also create a safe care environment focused on patients, families, and communities. The specific objectives involved that the center would be resilient to the most common natural hazards occurring in the region and that it would use local construction materials and natural ventilation to achieve airborne precaution standards and indoor temperature control.

The participants worked in three teams that focused on inner-city built-up areas (Ari, Bangkok), peri-urban informal settlements (Bang Si Muang, Nonthaburi), rural settings (Khlong Sam, Pathum Thani) respectively. These study areas not only exemplified various spatial, climatic, and socio-economic conditions (in terms of demographic profile, settlement density, accessibility to public services) of neighborhoods in Bangkok but also reflected the prevalent conditions in most of South-East Asian cities. For each of these sites, the working format included on-site explorative research and fieldwork, combined with lectures, design charettes, working sessions, peer reviews, and presentations.

With the aim of developing a learning pathway for the International Multidisciplinary Summer School, the authors adopted the integrative stepwise methodological tool of Jones and Van Ael for systemic design practice.[9] The 'system-wise' pedagogical method was hence introduced as the main methodological guideline while also taking on board elements of the *System Practice Workbook*.[10]

Systems approaches are not new to design theory and practice, and linkages between systems thinking and design thinking have been elaborated in a special issue of the *Strategic Design Research Journal* which demonstrated how a "systemic approach to design makes it possible to address multiple levels in an integrated manner and to engage local communities in co-creation processes that generate real, sustainable development".[11] This signals that systemic approaches in architecture and urban design have moved away from designing products and services *for clients* towards co-creating in a multidisciplinary process, sustainable solutions *with stakeholders*, whereby beneficiaries are involved from beginning to end.

Moreover, this approach corresponds to Téchne's objective to engage a wider involvement of technical experts in the public health response force, reflecting the WHO's efforts to accelerate progress towards the health-related aspects of the UN Sustainable Development Goals (SDGs), particularly SDG number 3, 'Good Health and Well-Being'.[12] A WHO framework has been developed which acknowledges that many global health challenges are complex issues which require a holistic approach as well as systems thinking methods and tools to respond to them.[13] Thus, the summer school was designed as a systemic journey fostering an interactive and authentic learning experience with collaborative design and peer review moments throughout the process to help the participants to define the key criteria and strategies for the proposed multiple disease treatment center.

2. SYSTEMS THINKING

To begin the systemic design journey participants were engaged in preparatory activities to develop an awareness of the health, institutional, and cultural background of the topic with visits to vernacular case studies (such as the Agricultural Museum Complex in Pathum Thani and Jim Thompson House Museum in Bangkok) to understand spatial and environmental best practices. In the introductory phase of the summer school, the participants were given an overview of the core principles of improving and ensuring good indoor ventilation by the Téchne coordinator based on WHO recommendations, followed by an introduction to systems thinking by the workshop coordinator, as well as an overview of Infection Prevention and Control by WHO Country Office - Thailand.[14] The participants engaged in a one-day visit of the three project sites, where they observed the social spaces and services in order to acquire the sense of place necessary to conduct the systems analysis, and decided on which site they would continue to work on for the development of their proposals.[15]

The first week of the program introduced a holistic approach to handle complexity through systems thinking. The process coached the teams through successive phases of framing the system, sense-making and analysis, and reframing it in function of what they perceived as a long-term goal for improving the access to health facilities in the area and a short-term objective leading towards that goal.

In the ‘framing’ phase, participants attempted to describe the current realities of their site. Based on a summary introduction of earlier fieldwork, they first hypothesized current neighborhood parts and relationships in their physical, socio-economic, and cultural dimensions. Field visits and site investigations enabled participants to verify their initial hypotheses against the local realities and to ascertain how stakeholders’ activities affected the system in that context.

‘Understanding the system’ involved exploring forces that were detrimental to the system (‘inhibitors’) as well as forces that could create positive dynamics (‘enablers’). Next, they focused on the most influential forces and analyzed their respective

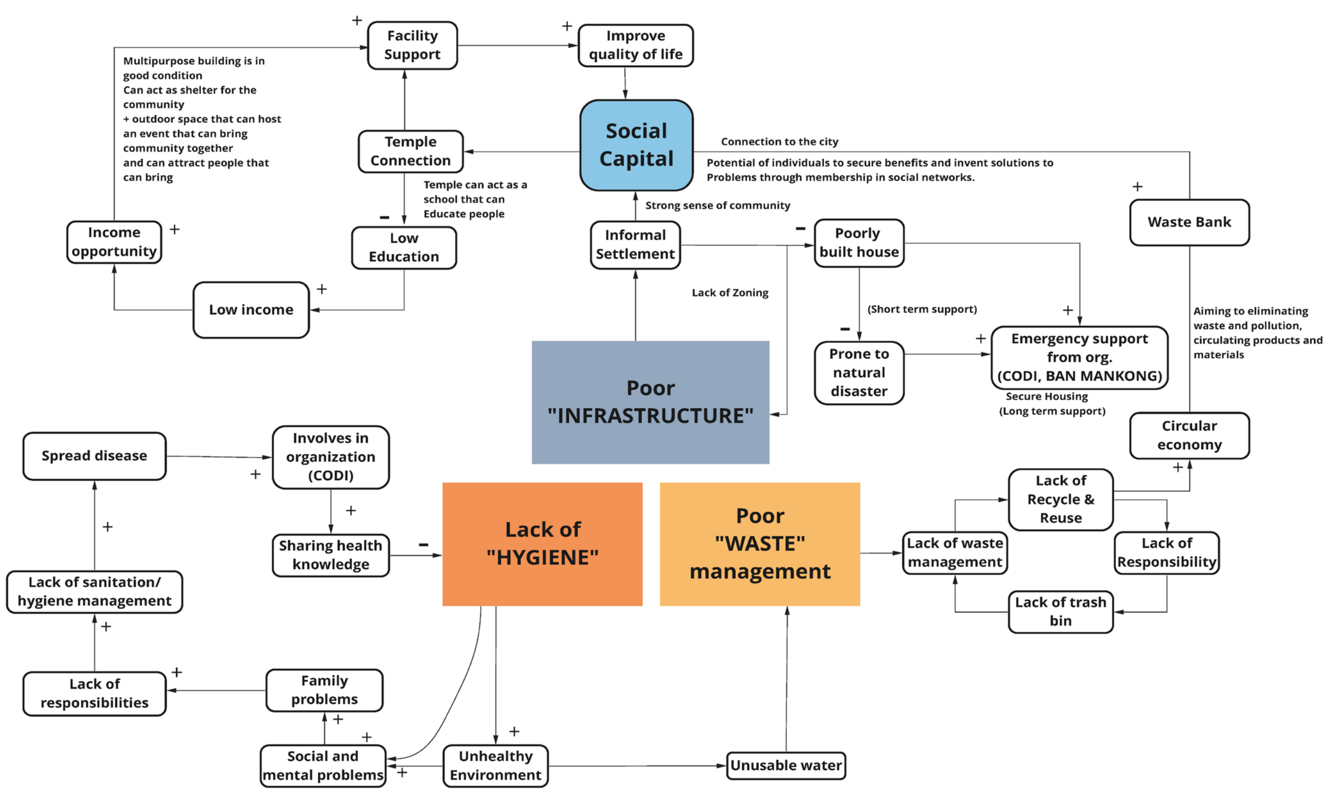

Figure 1. Final systems map. Group 2 Bang Si Muang, Nonthaburi, Thailand.

Figure 2. Identification of Leverage Points. Group 2 Bang Si Muang, Nonthaburi, Thailand.

causes and effects. These were then qualified to see whether the causes and effects were linked to the physical and social environment, to beliefs or value systems, or other social processes and interactions. Zooming in on the factor that they considered most important, the teams traced how that factor affected other factors and how these causes and effects led to causal loops which could either be making things worse, better, or keeping things from getting better or worse. This was captured by a series of causal patterns visualized as dynamic loops.

Having analyzed the forces that influenced the system and the inner dynamics of causes and effects, participants moved toward 'envisioning the desired future' of the system. They did this by clustering the aforementioned loops into thematic regions around central issues which drove the system dynamics. This then creates what is called a 'systems map', which is a holistic and cohesive visualization of the distinctive loops and the interconnections between the loops.

In the above example (Figure 1) of a systems map by the group who looked at an existing informal settlement community, we can see poor infrastructure, lack of hygiene, and poor waste management as being central issues which affect the healthcare system in a poor urban neighborhood. Lack of hygiene coupled with lack of sanitation and a generally unhealthy environment can cause spread of diseases, while social capital can overcome issues due to a strong sense of community resilience during the pandemic.

The mid-summer-school presentation gave each team an opportunity to test their understanding of the system by sharing their systems map to receive critical feedback which led them to review their current understanding of the system and identify what patterns kept the current system from behaving according to the short- and long-term objectives. Building on the acquired knowledge of the system, teams recalibrated the systems map and highlighted those patterns that they could disrupt, mitigate, or shift.

This then led to the identification of high-impact leverage areas. By determining high-impact leverage points steering towards a transitional or future system, each team formed connections between short-term impacts and long-term systems change and articulated leverage hypotheses that formed the basis for the second half of the summer school. To give an example from the group who looked at an informal settlement community, they identified community assets as key leverage points for change in the system. For instance, the multipurpose building on the site can serve as a school for the children, and when needed be retrofitted into a multiple disease treatment center (Figure 2).

Figure 3. Systemic Design – Lego model making. Photo by Adrian Lo.

3. SYSTEMIC DESIGN

The second week of the program revolved around systemic design workshops that articulated these leverage hypotheses into design strategies and interventions ranging from lifestyle changes to policy recommendations. The systemic design stage sought to link systems thinking with design thinking, by generating possible solutions to complex societal challenges, or so-called 'wicked problems', in a non-linear and iterative way to better understand the needs, perspectives, and interests of the various stakeholders or end-users. Such designs produce "delightful and quality products, services, experiences, or systems that work for those who use them".[16]

In the systemic design stage, for each of the three groups for three sites, participants developed ideas for a multiple disease treatment center. The proposal had to simultaneously produce a systemic matrix (matrix of prescriptive actions) and a building typology design (descriptive schematic set of architectural drawings) to increase natural ventilation and control indoor temperature, relative humidity, as well as natural daylight.

Groups collaborated to define the key criteria and strategies for this new building typology in various ways. The systemic design workshops were all about codesign that sought to articulate the leverage points with the most potential to improve the system. Following from the ideas of systems thinking and its insights on seeing the many interconnections across multiple disciplines and sectors in order to identify high leverage points, and in contrast to conventional design processes of learning by doing and prototyping, systemic design combines these two aspects, such that we are constantly zooming in and out of the problems, needing integrated thinking as opposed to binary or oppositional thinking, and starts to be what we can call co-creative through collaborative design.

On the first day of the codesign workshop students were engaged in the production of a Lego sectional model (Figure 3). This concept model enabled the groups to investigate a possible intervention at their chosen site, while also considering solar orientation and angles, sun shading, cross ventilation, prevailing wind, and other environmental aspects as discovered in their systems mappings. Groups took photographs of their model, from which they produced an annotated sketch section. Lego is useful in the collaborative design process as it allows people, of all ages and disciplinary backgrounds, to come together and explore ideas in space.

The remainder of the summer school saw the groups further develop their ideas conceived from the Lego sectional model into a proposal for a building design along with a matrix of strategies. Codesign brings ideas to the surface by testing ideas and presenting them to the other groups for peer reviews which helps to bring the essential issues or leverage points from the system mapping back into focus. In parallel with each group's building typology design, they had to identify actionable items for the systemic matrix in correlation with their systems map, strategies, and building design, as well as a roadmap (which was a step to strategize the leverage points towards a transitional or future system).

In the example of the group which looked at the agricultural community in Pathum Thani, they identified space requirements for the multiple disease treatment center such as spaces for screening and isolation, but also environmental considerations such as daylighting, natural ventilation with south facing openings, etc. (Figure 4). These formed the prescriptive principles to be translated into a building typology design for a site-specific multiple disease treatment center. This task to produce a systemic matrix was part of the collaborative design process where groups drew insights and visualized connections among the interrelated system issues, design proposals, and interventions so that all these design actions were reinforcing each other, as seen in the overlay of a systems matrix over a site image (Figure 5).[17]

Regarding the building design, each group had to identify detailed spatial and programmatic requirements according to the specific needs of the site from which they had to develop a zoning diagram. This schematic representation formed the basis to develop floorplans and sections, as well as a 3D digital model, all of which were collaboratively refined towards a final presentation.

To conclude the summer school, the participants prepared and compiled the outputs of the workshop into a hybrid final presentation for a multidisciplinary and international panel of experts consisting of faculty, design and planning professionals, as well as Téchne personnel.[18]

CONCLUSION AND WAY FORWARD

Before moving to the conclusion of this paper it is worth acknowledging some of the limitations of the aforementioned summer school. These included the limited number of field visits to the three study and project sites as well as the time constraints resulting in a compacted version of the methodology proposed by Jones and Van Ael.[19] Combined with limited opportunities to involve the stakeholders in the study areas, the systemic design outcomes may not have corresponded to the efforts invested in the dynamic systems analysis.

Nevertheless, the summer school experiment was conducted to the satisfaction of all parties involved, and the organizers have agreed to extend the initiative in a more elaborate format for two more years (2023-2024). In consultation with WHO Téchne and the WHO Country Office - Thailand, the exercise is set to elaborate a widely applicable graphical checklist and design brief for primary healthcare (PHC) centers in flood-prone suburban and rural settings which are climate resilient and environmentally sustainable in the face of infectious disease outbreaks and natural hazards.

Preparations will be coordinated in partnership with a broad range of expertise including the fields of architecture, urban design, engineering technology, public health, and nursing, as well as local stakeholders and beneficiaries. Moreover, the scope of intercultural and interdisciplinary exchange will be broadened by inviting participation of students and instructors from various partner universities in the region to make sure that efforts during the summer schools are premised on reliable data and knowledge exchange. This approach to architecture and design is characterized by Doucet and Janssens as "the integration of discipline and profession (theory and practice) in knowledge production, the ethical dimension, and the importance of experimental, *designerly* modes of inquiry."[20] The initiative will seek to enhance participants' knowledge and insights in the subject matter through comparative PHC case studies from their respective home countries as a basis for testing and fine-tuning the checklist and developing a design brief which WHO could disseminate throughout the region.

According to UN-Habitat, "The emergence of urbanization as a global mega-trend is intertwined with the existential challenges that the world has faced in the last 50 years, including climate change, rising inequality and the rise in zoonotic viruses."[21] Ever since 2009, the WHO-based Alliance for Health Policy and Systems Research (HPSR) has been advocating systems thinking approaches to strengthen health care systems in the face of these challenges.[22] As a result, "Systems thinking methods and tools are increasingly being used to explain epidemics and to inform programmatic expansion efforts".[23] WHO Téchne thus could rely on WHO's experience in systems thinking to pursue combating the spread of Covid-19. When the network widened its scope of action to include ever more complex health challenges, it required additional competencies to effectuate tangible changes linking global challenges, local crisis situations and interventions alleviating health hazards. The collaboration with this summer school not only offered a chance to refresh the ethical dimensions of architectural education but also to combine systems thinking with systemic design as introduced by Harold Nelson and Erik Stolterman.[24] While system thinking provides a way to identify high-leverage interventions in complex hazardous situations and health crises, the combination

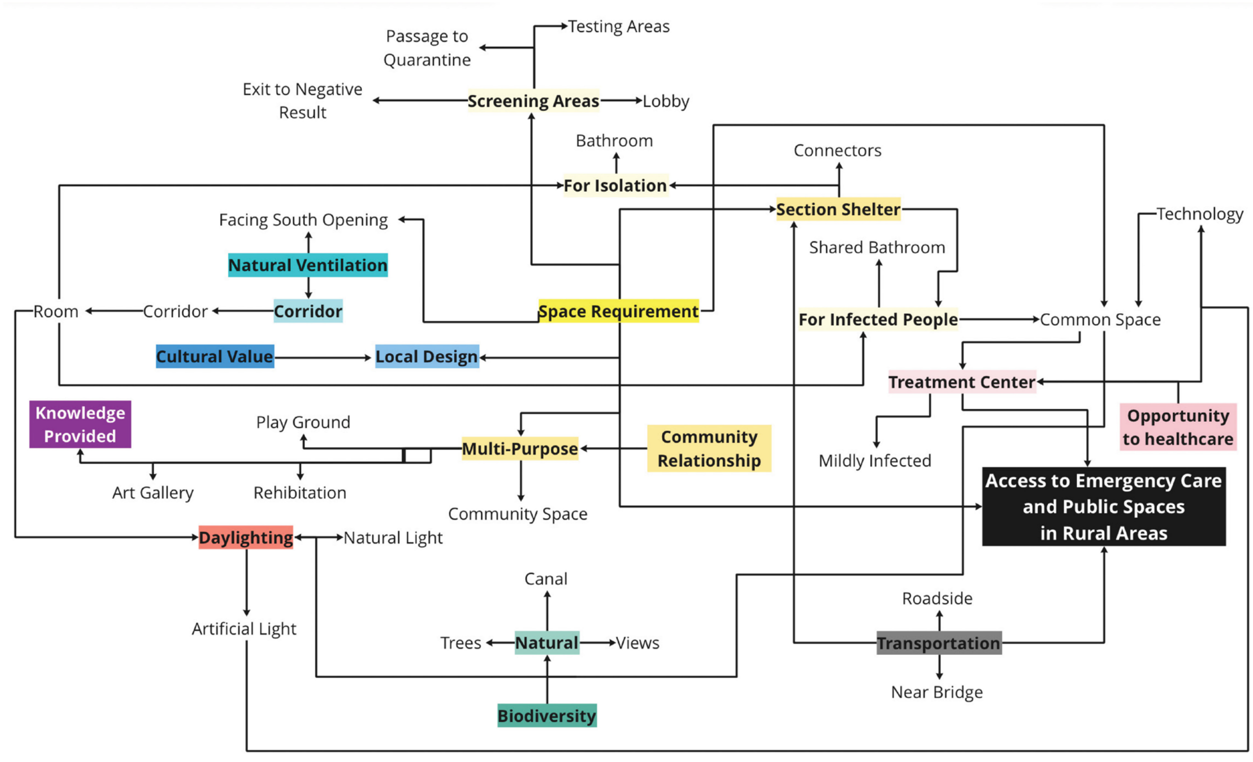

Figure 4. Systemic Matrix. Group 3 Khlong Sam, Pathum Thani, Thailand.

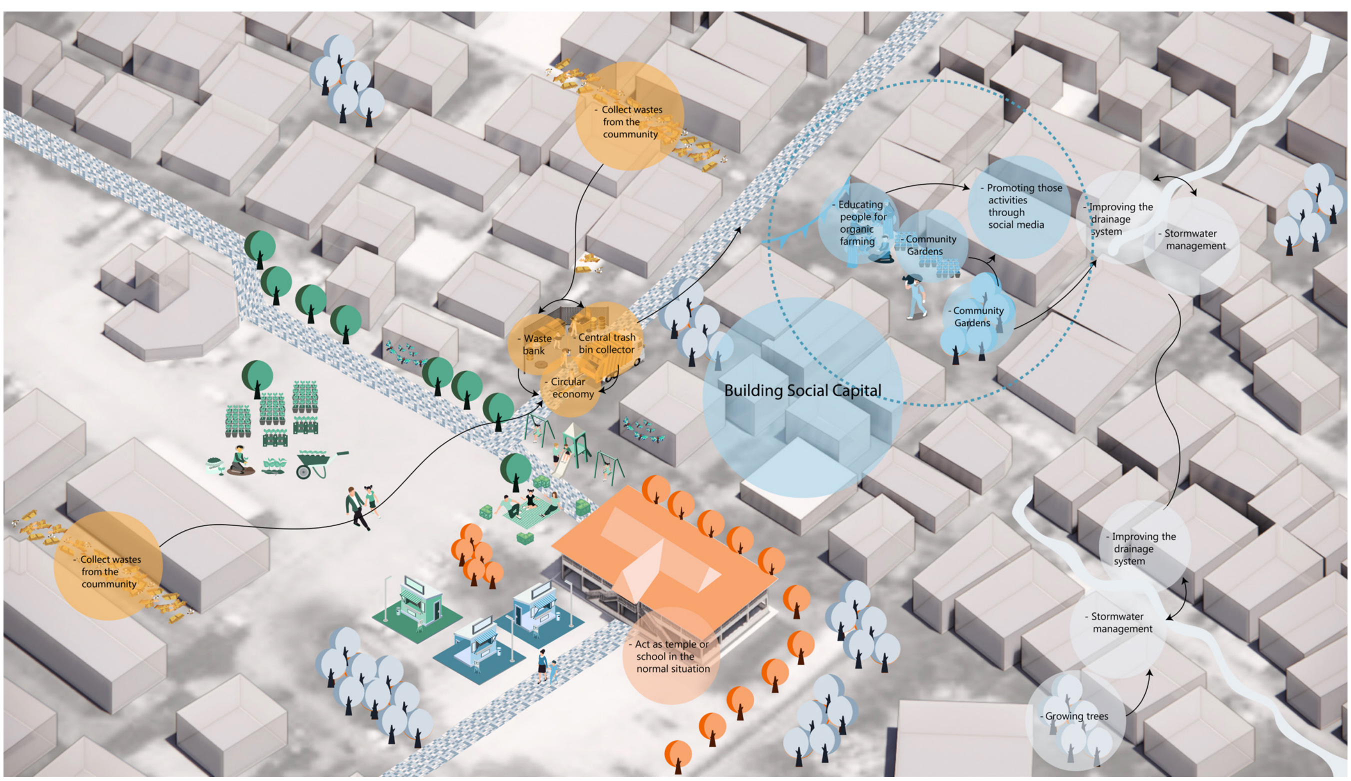

Figure 5. Systemic Matrix overlay. Group 2 Bang Si Muang, Nonthaburi, Thailand.

with systemic design creates an integrated framework that can materialize these interventions into innovative adaptations of the built environment and achieve lasting change in a multidisciplinary and organizationally effective way.[25]

In conclusion, the summer school 2022 experiment served to introduce 'system-wise' approaches into architectural and design education by exploring the ways how systemic design can be mainstreamed into the WHO Téchne network in delivering safer, healthier, equitable and sustainable healthcare systems. As a contribution to the post-pandemic reassessment of cosmopolitanism this collaborative pedagogy demonstrates how systems thinking and systemic design can effectively address complexity and reveal the societal and ethical relevance of architectural education in the face of specific local challenges.

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