



Charrette:essay

Embedding urban sustainability through research, teaching and strategic planning.

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ABSTRACT In a world fundamentally changed by global warming and mass urbanization the question of urban sustainability is a central challenge for the professions of the built environment and the education of their professionals. This essay discusses the triadic relationship in architectural education between academic research, the Architecture Design Studio (ADS) model and the strategic approach for the Faculty of Architecture and Urbanism at the University of Chile. The authors present three case studies that together, attempt to embed the question of urban sustainability as a focus in the research, curriculum and practice of this faculty. This essay firstly considers academic research undertaken into two socially integrated housing developments and the segregation of cities as a teaching environment and as a catalyst to create a forum for academic and students research activities. The authors then combine the unique aspects of the ADS model with urban intervention to connect the design problem of urban sustainability to a physical reality. Lastly, the strategic approach of the Faculty of Architecture and Urbanism is used as a structural opportunity to embed urban sustainability across, between and through curriculum and academic development and teaching. In conclusion, the authors unpack the tensions revealed in this triadic relationship at the leading public university of Chile—a country of the Global South and member of the OECD.

KEYWORDS: Urban sustainability, Chile, Studio Teaching, Strategic Planning, Research.

Introduction

In a world of change, the integration of research and teaching have been identified as central to the strategic approach of universities to deliver the most flexible and relevant model of education. In architectural education, the Architectural Design Studio (ADS) is noted for its particularly creative and effective model for education that promotes action and change.¹ The strategic direction of the university is pressured by the sometimes conflicting forces of globalisation and national priorities specifically in relation to the role of tertiary education in economic development.²

The global impact of climate change is compounded by the eventuating reality of an urbanized planet. 'Cities consume as much as 80% of energy production worldwide and account for a roughly equal share of global greenhouse gas emissions.'³ However, as asserted by Deyan Sudjic, that while 'urbanization has brought massive change (...) it is not uniformly distributed.'⁴ As a case in point, Chile is a country that is both of the Global South and a recent OECD member that has had over two decades of strong economic growth. During this period, the glaciers that covered the Andes Mountain range have receded and the capital, Santiago, has grown to house over 40% of the country's population. Yet, the country has set itself world-class renewable energy targets.⁵

The University of Chile was founded in 1848 shortly after independence, and the first study of architecture commenced the following year. Radical reforms of architectural education in the 1940s and 1960s were followed by a military dictatorship (1973-1989) that dismantled the University of Chile's national presence and role. Recent public debates have concerned the changes imposed on education during that period and the subsequent and constant debate about university education.⁶ The Faculty of Architecture and Urbanism (FAU) at the University of Chile, has been at the forefront of this debate. However, the pressing national and global question of urban sustainability and the environmental impact of cities has not gained the same level of attention.

In Chile, the profession of architecture (that implicitly includes urbanism) has a similar professional and social status, social responsibility and role to that of medicine and law. As such, the University is charged with

the professional accreditation of architects that enables them to practice.

This essay argues that a triadic relationship, between academic research, the ADS model, and the priorities of the architecture faculty (as expressed in the strategic plan) is an important vehicle for the University to assume a leading role in urban sustainability. Thus, we will examine the interrelationship between these three elements as they developed through: national priorities for academic research funding and the research community of the University; urban intervention as it relates to undergraduate architectural studio teaching; and the process for the development of the recent strategic plan for FAU at the University of Chile.⁷ FAU has three disciplines, Architecture, Design and Geography.

Andrés Bernasconi identified the University of Chile, and universities in Chile generally, as a research orientated university, rather than a research university as such. According to Bernasconi, this is evident in the contradiction between its high national level of research funding and research outputs and the limits that its structure, governance and recruitment practices place on the development of a research community.⁸

Funded Research

In Chile, the overwhelming majority of funding for academic research is provided by Fondecyt, the main competitive research fund of the National Council for Scientific and Technological Research (CONICYT) (*Comisión Nacional de Investigación Científica y Tecnológica*). Funding is awarded to research which impacts on the scientific community and the general society. The University of Chile is one of the top two recipients of Fondecyt research funds.

In 2006, the Chilean Ministry of Housing and Urbanism (MINVU) identified social integration as a key contributor to the urban sustainability and one of the main objectives of the Urban Housing Policy.⁹ Under this policy, social integration is to be developed through Socially Integrated Housing (SIH) projects.

Since the deregulation and privatization of urban land release between 1973 and 1989, land speculation has driven urban development and pre-determined the location of housing for the poorer sectors of society to the periphery of cities.¹⁰ The return to democracy in 1990 did



Figure 1: Location of Casas Viejas, Puente Alto, Santiago and Villa las Araucarias, IV Region, La Serena, 500 kilometres north of Santiago. (Authors)

not change this situation. Rather, successive elected governments guaranteed this housing market specifically for low-income home ownership through different forms of subsidy. Within this urban segregation, Chile has one of the highest home ownership rates among OECD countries.

Through the lens of the urban sustainability, the authors lead a research project funded by Fondecyt to investigate two emblematic projects of the SIH program. The first SIH project was *Casas Viejas*, built in 2008, located on the outskirts of the metropolitan area of Santiago in the municipality of *Puente Alto*. The second SIH project was *Villa las Araucarias*, built in 2009 and located on the periphery of the provincial city of La Serena, in the IV Region, 500 kilometres north of Santiago (Figure 1). The research project involved collaboration with MINVU and CEGA (Centre of Excellence on Geothermal Energy of the Andes, part of University of Chile).

The integration of the funded research with undergraduate teaching provided students undertaking their final year thesis project with a real-life case study. As part of this teaching, a team of six students undertook a spatial analysis and building assessment of the distribution, typology and use of public space

and housing design of the two types of housing defined by MINVU in the two SIH projects. Members of the same student team undertook a door-to-door survey of residents to ascertain demographic data, satisfaction levels with the quality and location of housing, travel patterns for educational services and employment, participation in community and social life and attitudes towards the public space environments. A student utilised specific software to analyse this data to create a resident profile.

A postgraduate student undertook an audit of the housing energy performance of housing in the two housing projects using purpose-built software. Most houses had been poorly modified and extended by the occupants, which lowered their energy performance and increased the heating costs for the residents. To measure this impact a comparison was made to the performance of the original purchased house.¹¹ Another undergraduate student, using CAD, developed floor plans of the modified houses and, in a follow up survey, distributed the floor plans to the residents.

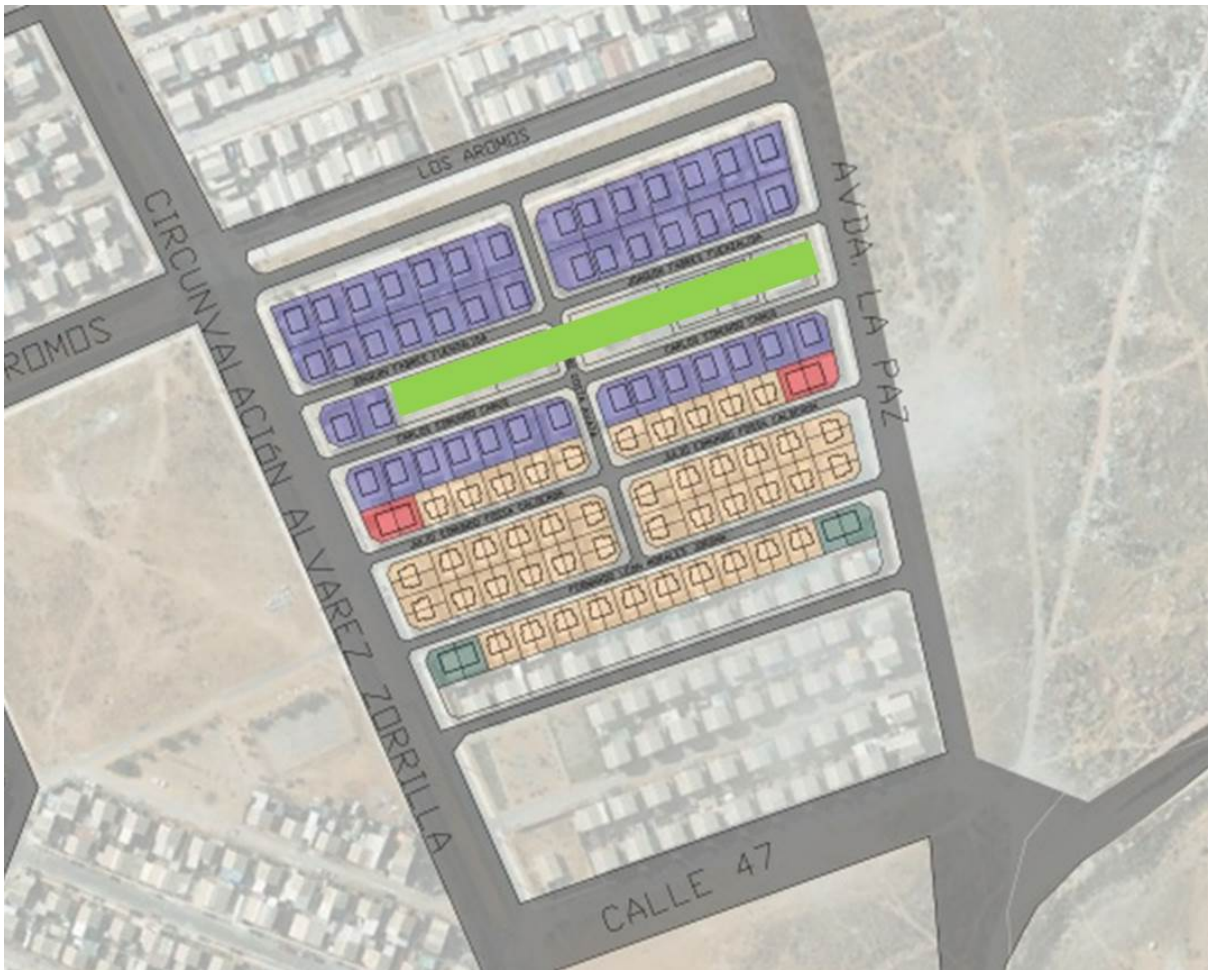


Figure 2: Site Plan showing the urban design with the two housing types segregated by open public space in Villa las Araucarias, La Serena. (Authors)

The information produced through this teaching informed a central tenet of the research. These surveys, assessments, analyses and audits revealed a conflict between the policy objective of social integration and its implementation through the design and construction of Socially Integrated Housing projects. This conflict was evidenced in both SIH projects in their urban location and the urban and housing design. The central conclusion drawn from the teaching/research process was that the SIH projects had created a *new typology of segregation*. A first form of segregation was created by the peripheral location and poor transport connectivity. A second form of segregation was created by the urban design of *Villa las Araucarias* that divided the housing project into the two housing types by an open public space. In *Casas Viejas*, residents enclosed the public urban space excluding themselves and these public spaces from the remainder of the estate (Figure 2 and Figure 3).

One student, Scarlet Campos, completed her major thesis project into public policy in response to the urban sustainability questions raised by the segregation created in Villa las Araucarias.¹² Another student, Victor Manuel Rodríguez, co-supervised by academic members of the Faculties of Engineering and FAU, based his undergraduate thesis project in engineering on the degraded energy performance of *Casas Viejas*. His research explored the viability of using geothermal energy, available in large parts of central and southern Chile, in this housing development.¹³ Rodríguez' thesis demonstrated that geothermal energy for climate control proved to be a feasible and cost-effective system, if installed at the point of construction of the SIH project. These results were presented back to MINVU.



Figure 3: Site Plan showing the enclosed cul-de-sacs in Casas Viejas, Puente Alto, Santiago. (Authors)

For the team of students, this funded research afforded a real subject of enquiry and a link between the teaching at undergraduate level and as a transition to postgraduate studies and research. The research project engaged architectural students with communities outside both of those of the university and architecture.

At the end of the research project, the topics of urban sustainability, national priorities and the methods of research that involved teaching, formed the catalyst and the frame for a symposium on research activity within FAU at the University of Chile (2016). Entitled *Feria de Investigación* (Research Fair) and *Research Speed Dating*, this one-day event focused on academic research, architectural education and academic development as fundamental to the faculty's objectives. As the culmination of many outreach activities within the same research project, the event was used as a platform to bring together, promote and focus research concerned with urban sustainability within FAU and to introduce the student

population to this dialogue. The combined research of academic staff within the faculty, reinforced the development of research skills within undergraduate and postgraduate teaching. These research projects were documented as a resource for the faculty.

Architectural Education

The Architectural Design Studio (ADS) model is situated at the centre of architectural education due to its unique form of teaching and learning.¹⁴ As identified by Brent Carnell 'the discipline of architecture is ideally suited to lead the way in research-based education', while strengthening a 'tradition of authentic learning in a community of practice.'¹⁵

Through ADS, students can experiment and research within the safety of an academic environment, while ascertaining the problem, making rational decisions, making judgements and comprehending the significance of their actions.¹⁶ We locate urban sustainability in a

live project to examine and enrich the ADS's attributes as a unique teaching tool.

Sustainable University Campus, its Neighbourhood and Surroundings, was one workshop developed for the third-year undergraduate studies in 2015, with the physical and everyday place of the University Campus as the urban site for this subject. The city and the various neighbourhoods within which the university's campuses are located become an extension of this social and physical site and the subject of the studio in terms of the design problem of urban sustainability.

The first workshop was a study of sustainability policies and practices within the University campus as it related to its urban setting. Through the disciplines of architecture and anthropology, students undertook an analysis for the three scales at which the university related to its urban setting (campus, neighbourhood and the environment). In this first workshop, urban sustainability is set in a predominantly residential neighbourhood.

The second workshop objectives were similar to the initial one, but in this studio the neighbourhood consisted of three separated campuses within the city centre. The students task was to develop proposals for interventions based upon the 'Ten principles of an innovative model for the 21st century university: the educational campus.'¹⁷

In this workshop, the opportunity emerged to engage with an urban intervention festival occurring in the area between the three campuses. Practical urban intervention functions as an intermediary between the ADS and architectural practice. It affords a controlled environment and scope within which students engage with a community of users. The students simultaneously designed and constructed a physical element of the built environment that was ephemeral or temporary. The interdisciplinary praxis of art and architecture was used as a way of thinking about the relationship between urbanism and sustainability. For example, Alfredo Jaar's 'Studies of Happiness' was part of the artistic practice of ephemeral urban interventions created during the dictatorship.¹⁸ In 2017, the same work was the curatorial framework for the 2017 Architecture and Urbanism biennale in Valparaiso Chile. The works of Christo and Jean Claude (Running Fence, 1972-1976, Rhiechstag, 1989 and New York Gates 2005),

Joseph Bueys (7000 oaks, 1982 – 1987), Vito Acconci (Dirt Wall, 1992 and Mur Bridge, 2003) and Francis Alÿs (When Faith Moves Mountains, 2000) were examined to see how they pertained to and influenced architectural and urban critique and practice in relation to the urban sustainability.

The site was a major intersection in the main avenue, *Libertador Bernardo O'Higgins*, commonly known as Alameda. Alameda is the Spanish word for the Alamo tree, and refers to the 19th century tree-lined avenue that has been transformed into the current eight-lane thoroughfare for metropolitan Santiago, that is, to a degree, re-lined with trees.

The project asked students to consider the dependence that urban sustainability has on the natural environment and whether this is evident in the city.

From a spatial analysis of the intersection and its use, students selected the site of a repeatedly damaged tree as the vehicle for their intervention. The tree was located outside a main Metro station that connects the city to the two most prestigious universities in the country— the University of Chile and the Catholic University—and is in front of the National Gabriela Mistral Cultural Centre (GAM).

In small groups, students developed proposals that were functionally based on the protection of the sapling and conceptually grounded in the ideas of land art, social sculpture and urban intervention in art. One proposal was selected and realised by the entire class (Figure 4).

'To save a tree' was a protective girdle made from a felled tree trunk. The trunk was sliced into sections and splayed to form a rotated series of platforms suspended around the young tree (Figure 5). Upon each of these seven plates is an engraved fact about the tree's contribution to our survival. Around a nearby second tree, a stencil of leaves was used to paint the shadow of the recently planted tree on the surrounding footpath. (Figure 6)

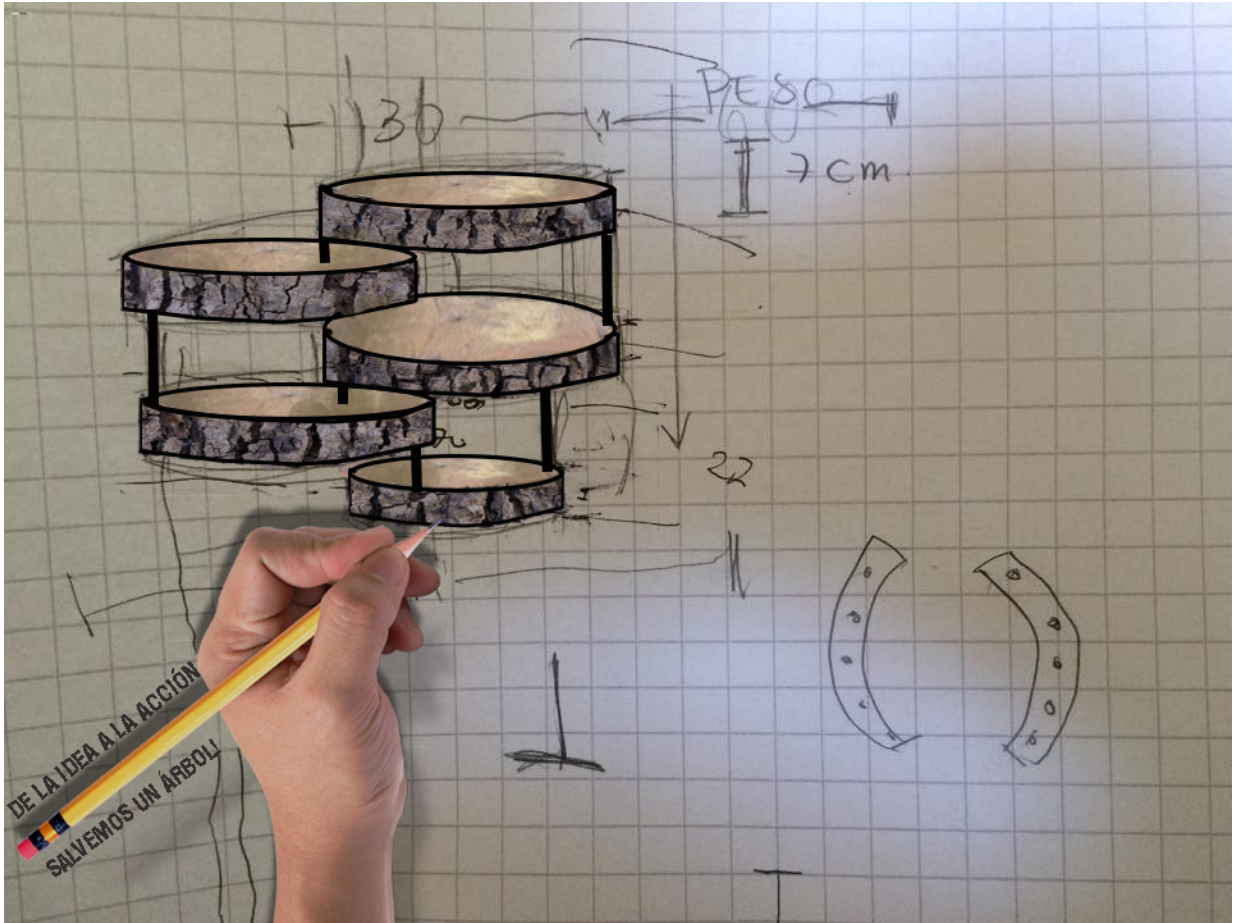


Figure 4: Selected concept for the urban intervention. (Student)



Figure 5: To Save a Tree. 100 en 1 Día Urban Intervention Festival. Installation view. Alameda Avenue, Santiago, Chile (Authors)

At the time of writing, the intervention, originally proposed for a one-day festival, has been in site since November 2015 as has the growing tree it protects. While the painted shadow of the second tree has faded underfoot and this tree destroyed several times, ‘To Save a Tree’ remains as an unsanctioned permanent intervention in the main street of Santiago (Figure 7).

Urban sustainability is at root of the design problem in this workshop, but the model of the ADS is enhanced. Several foundational elements of architectural education are brought to the fore in the idea of urban intervention. The concepts of skill and knowledge (Habraken, 2007),¹⁹ reflection and action (Schön),²⁰ and learning by doing (Dewey),²¹ are woven between and within each of the design, construction and intervention processes. The students engage and impact upon the communities outside and in addition to the university and architecture.



Figure 6: To Save a Tree. 100 en 1 Día Urban Intervention Festival. The painted shadows of the tree. Alameda Avenue, Santiago, Chile. (Authors)



Figure 7: Academics and students after the installation of what was then thought to be a temporary intervention. (Authors)

Strategic Planning, National Priorities and Urban Sustainability

At the University of Chile, the creation of the Development Plan for the Faculty of Architecture and Urbanism *Plan de Desarrollo FAU 2030*, or PD FAU 2030, established three priority areas that encompassed and defined the emphasis of teaching and learning, academic research and development, and administrative and organisational management for the faculty. These strategic priorities are Habitat, Sustainability and Innovation (Figure 8). The timeframe in the adoption of the PD FAU 2030 is of important note. For the first time, the FAU development plan reinforces the notion that to be sustainable, development is beyond the four-year period of the faculty Dean's appointment.

In the drafting of PD FAU 2030, key reforms and statements from the University of Chile were studied to establish the Faculty of Architecture and Urbanism in terms of its social role and to contextualise a response to



Figure 8: Cover of PD FAU 2030 showing the 3 strategic priorities. (FAU)

the emerging global architectural and urban design problems.

Founded on humanist principles, the university was established primarily to incorporate new scientific methods and to generate knowledge that would grant Chile economic, political, cultural and social autonomy. As a foundational public university, it holds a unique role in the formation of the Republic of Chile and the subsequent process of modernising the culture and the economy that occurred from the late 19th to the mid-20th century. The 1946 education reforms in the teaching of architecture at the University of Chile were based in the philosophy, theory and practice of the Bauhaus that were grounded in the relationship between industry, technology and design. These reforms were specifically implemented for what was described as ‘the consolidation of modernity.’²² Reforms such as these equipped a generation of architects and urbanists to frame a response to the challenges of massive urbanisation in the 1960s. This was in the form of medium to high-density social housing and metropolitan transport infrastructure that included the Santiago Metro system approved in 1965.²³ In unison, a mature understanding of the now globally recognised theories of sustainability can be seen in the officially approved planning projects for Santiago of the same period. The work of Juan Parrochia Baguín, Architect and Urbanist educated at the University of Chile 1947 - 1952, concerns the urban planning of the metropolitan corridor of Santiago and its importance. The academic of FAU, María Isabel Pavés, argues that Parrochia Baguín’s concepts strategically conserved the natural capital in dialogue with the development of urban systems and infrastructure.²⁴

In the 1990s there was a resumption of the social function of the University of Chile and the Faculty of Architecture and Urbanism (FAU) towards urban sustainability. A former Dean of FAU, Edwin Haramoto, said in 1993,

*Knowledge of the territory depends on the quality and conditions of its habitability, within the framework of a close relationship with the environment. The development model adopted by the country based on the concepts of sustainability and equity, give the field of the Faculty a role of first importance, given its contribution to the definition of the living environment for humans and their quality of life.*²⁵

The methods to develop the PD FAU 2030 included the aforementioned study as part of the literature review. Stakeholder meetings were conducted with the three departments (Architecture, Design and Geography) and two institutes (Institute of Housing and the Institute of History and Heritage) of FAU and their respective Directors. Together with academic and non-academic staff, an analysis of the current state of play was undertaken across undergraduate, postgraduate research, academic development, communications, human resources, financial management and planning. In addition, surveys were undertaken to ascertain the priority interests and aspirations within the faculty staff (academic and non-academic) and undergraduate and postgraduate students. This process initially identified the three areas of Habitat, Sustainability and Innovation as strengths.

The survey results also identified sustainability as a priority interest to develop further. In answer to the survey question ‘What will be the image of the Faculty in 15 years or more?’ *Sustainable Campus* ranked fourth out of seven possible responses. The *Contribution to national priorities* was the first given response, followed by *Faculty as a national and international reference* and then *International collaboration*, which was ranked third.²⁶ Each of the top four ranking answers is related to the issue of the sustainability of the university in terms of its environment, its social role and its national significance. In response to the question ‘What actions are necessary to include in the development plan to improve FAU?’ the first answer was ‘Align the themes of undergraduate and postgraduate subjects with those needed for a changing world and for the country.’²⁷ In response to the question ‘What physical spatial changes do you

consider important to implement in the Faculty? What changes would have the most relevance?’ The response of the implementation of renewable energy systems was clearly indicated as the priority.²⁸

The strengths of the activities of the university in the three strategic areas and the gaps in achieving these aspirations, were identified as the basis for strategic projects. As one of the three key strategic directions, Sustainability is part of the 23 strategic projects over the life of the plan. However, it is *Strategic Project 13* that clearly articulates the areas and measures of actions in relation to sustainability and how they translate into teaching and learning and professional and institutional development.

Project 13 is framed to ‘Develop and deliver in the areas of undergraduate and postgraduate studies, research and in the dissemination of the themes of sustainability in all of its fields.’ This project is for the short to medium term (5-10 years) and sits across the Directorates of Academic Development and International Relations and Outreach, the Schools of Undergraduate and Postgraduate studies, and all departments and institutes of the faculty. It will be implemented by an evaluation of ‘the current state of the three careers, the postgraduate studies, research and outreach and develop a plan for the inclusion of this content and themes and establish measures.’²⁹ These measures include performance indicators and designated percentage increase in the academic activities, with the content and theme of sustainability in all its areas.

The Vision for the faculty articulates its aspiration in terms of the nation and the region underpinned by sustainability as one of three strategic priorities. The faculty now has the vision:

*To become the most influential Faculty in South America in the generation and implementation of interdisciplinary knowledge of human habitation at its various scales by the year 2030. This will be demonstrated through the recognition of the quality of its programs, graduates and their contribution to public policies, programs and life. Through diversity, innovation and collaborative work we will promote sustainability and improve the quality of life of society.*³⁰

Through such strategic planning, urban sustainability is not simply a principle for the design problem of ADS teaching at undergraduate and postgraduate and research

levels, but becomes a given at a faculty level and its *social role* in the leading public University of Chile.

Conclusion

The task of embedding urban sustainability into architectural education discussed in this essay is set within the leading public University of Chile as a country of the Global South and OECD member. The national challenges of urban segregation, the historic and contemporary role of social housing and the role of education in urban development, sets the question of urban sustainability as a national priority.

In this article we have explored how the three elements of research, teaching and strategic planning each hold a mechanism within which to introduce urban sustainability as the design problem into architectural education. This has been an iterative process, whereby a research project into the social segregation of cities has opened into several different areas related to urban sustainability. These areas included issues such as, comfort levels in low income housing and how this relates to renewable resources and energy supply. The student team that gathered around this project brought with them a variety of research interest that would be galvanised through this project: public policy, geothermal thermal engineering, housing design, construction and energy performance.

Each of these elements has revealed an interrelated attribute that can build an integrated approach for the faculty. This approach can be applied across different disciplines and in their research activities. In each discipline, the approach could involve all levels of undergraduate teaching and set the groundwork for postgraduate study, research and practice.

The funding of academic research by Fondecyt into urban sustainability demonstrates that this field is gaining national importance. This research in turn analyses, critiques and develops the concepts underpinning national government policy and programs and the practices of the private sector. Teaching and fieldwork for students based in this research extends the concept of urban sustainability. It built skills and tangible bridges for students through the development of methods of investigation that are applicable for future master studies and research.

The integration of teaching and research and the learning of research skills is illustrated in Rodríguez' thesis project that had a cross disciplinary supervision between the Faculties of Architecture and Engineering and the collaboration of MINVU and CEGA. This aspect of the research project further deepens the relationship between the university and the public policy in the question, or at least the critique of urban sustainability in public policy.

The one-day Research Fair presented an opportunity for the creation of a permanent research project database. It located research and urban sustainability within the strategic thinking of the faculty.

Architectural Design Studio teaching and the community of practice beyond the university are the unique contributions that architectural education brings to the university. However, in the question of urban sustainability, intervention, as defined in and by art practice, proved to be an effective intermediary between the design studio model and architectural practice. Cross-disciplinary teaching — anthropology, art, engineering, architecture, urbanism— served both architectural education and this intermediary well. In architectural teaching, intervention locates the design problem through the conception, production and reception of a one-to-one scale work. The 'learning by doing,' 'skill and knowledge' and 'reflection and action' of effective teaching and learning are heightened by the intervention that is analogous to the processes and concepts of urban sustainability.

The development of the strategic plan for the Faculty of Architecture and Urbanism sits at the nexus of academic research, teaching and learning, the national priorities and global pressures related to tertiary education. In terms of sustainability, it needs to set the direction and emphasis for the faculty for at least the next decade. The process of strategic planning established, in part, where and how urban sustainability relates to research, international relations, teaching and curriculum and academic development across the different disciplines of the faculty. To have relevance, the monitoring of its progress will be as important as embedding urban sustainability into its structure.

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