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THE PROJECT OF MAGDALENA GUTIÉRREZ: THE POETICS OF LIVING IN THE ATACAMA DESERT. THE FOUR MODES OF CLIMATE MANAGEMENT.

EL PROYECTO DE MAGDALENA GUTIÉRREZ: POÉTICA DEL HABITAR EN EL DESIERTO DE ATACAMA. LOS CUATRO MODOS DE GESTIÓN DEL CLIMA.

O PROJETO DE MAGDALENA GUTIÉRREZ: POÉTICA DO HABITAR NO DESERTO DE ATACAMA. OS QUATRO MODOS DE GESTÃO CLIMÁTICA.

Figura 0. Fachada Norte Casa Taller. Fuente: Elaboración Propia del autor.

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RESUMEN

El estudio aborda la problemática de las formas de habitar en entornos ecológicos frágiles, como los son los oasis en los desiertos. Es así como el oasis de San Pedro de Atacama presenta en la actualidad una disminución de su área agrícola debido a la urbanización y el turismo, afectando la sostenibilidad de las prácticas tradicionales de cultivo y poniendo en riesgo el equilibrio ecológico y cultural de este paraje atacameño. El artículo expone estrategias sostenibles de diseño para el habitar contemporáneamente en entornos frágiles, examinando cualidades térmicas y estrategias de control climático aplicado al caso de la Casa Taller de Magdalena Gutiérrez, utilizando los principios de Lisa Heschong y Eva Horn, se incluye en esta revisión los modos de gestión climática de Reyner Banham. La metodología empleada combina un análisis arquitectónico y etnográfico, estructurado en tres etapas: selección de obras, construcción del marco conceptual, análisis y sistematización de la obra. Se utilizaron modelos, fotografías, mapas y esquemas para contrastar teorías y cualidades térmicas y culturales con evidencias de la obra. Los criterios de clasificación incluyeron la evaluación de características como el grado de privacidad de las áreas y recintos, ventilación, iluminación, aislamiento térmico y métodos de calefacción, se empleó una calificación binaria para la evaluación sistemática. Los resultados destacaron que la Casa Taller es manifestación del habitar poético en la exterioridad del desierto de Atacama, sugiriendo una vocación para actividades comunitarias. Las cualidades lumínicas revelaron un diseño estratégico que maximiza la luz natural controlada, utilizando aberturas y claraboyas. Se concluyó que la casa Taller representa una expresión del "Regionalismo Crítico revisitado", en este enfoque, la relación "sitio-forma" es fundamental, equilibrando la técnica local con la cultural y el entorno natural. Esta obra ofrece un modelo sostenible para habitar en entornos frágiles, en el que se integra adecuadamente el diseño arquitectónico con las condiciones climáticas y culturales del lugar.

Palabras clave: diseño arquitectónico, construcción en tierra, arquitectura tradicional, arcilla, materiales de construcción.

ABSTRACT

This study addresses the issue of living in fragile ecological environments, such as oases in deserts. Currently, the oasis of San Pedro de Atacama is experiencing a decrease in its agricultural area due to urbanization and tourism, affecting the sustainability of traditional farming practices and putting at risk the ecological and cultural balance of this Atacamenian locale. The article presents sustainable design strategies for contemporary living in fragile environments, examining thermal qualities and climate control strategies applied to the "Workshop House" or Casa Taller of Magdalena Gutiérrez. Using the principles of Lisa Heschong and Eva Horn, the review also includes Reyner Banham's climate management modes. The methodology combines architectural and ethnographic analysis, structured in three stages: selection of works, construction of the conceptual framework, and analysis and systematization. Models, photographs, maps, and diagrams were used to contrast theories and thermal and cultural qualities with evidence from the work. Classification criteria included evaluating characteristics such as the degree of privacy of areas and rooms, ventilation, lighting, thermal insulation, and heating methods, with a binary rating employed for systematic evaluation. The results highlighted that Casa Taller manifests poetic living in the exteriority of the Atacama Desert, suggesting a vocation for community activities. The lighting qualities revealed a strategic design that maximizes controlled daylight, utilizing openings and skylights. It was concluded that the Casa Taller represents an expression of "Revisited Critical Regionalism." The "site-form" relationship is fundamental in this approach, balancing local techniques with cultural and natural surroundings. This work offers a sustainable model for living in fragile environments, where architectural design is appropriately integrated with the place's climatic and cultural conditions.

Keywords: architectural design, earth construction, traditional architecture, clay, building materials.

RESUMO

O estudo aborda o problema das formas de vida em ambientes ecológicos frágeis, como oásis em desertos. Assim, o oásis de San Pedro de Atacama está sofrendo atualmente uma redução em sua área agrícola devido à urbanização e ao turismo, afetando a sustentabilidade das práticas agrícolas tradicionais e colocando em risco o equilíbrio ecológico e cultural dessa paisagem do Atacama. O artigo apresenta estratégias de design sustentável para a vida contemporânea em ambientes frágeis, examinando as qualidades térmicas e as estratégias de controle climático aplicadas ao caso da Casa Taller de Magdalena Gutiérrez, usando os princípios de Lisa Heschong e Eva Horn, incluindo os modos de gestão climática de Reyner Banham. A metodologia empregada combina uma análise arquitetônica e etnográfica, estruturada em três etapas: seleção de obras, construção da estrutura conceitual, análise e sistematização da obra. Modelos, fotografias, mapas e diagramas foram usados para contrastar teorias e qualidades térmicas e culturais com evidências do trabalho. Os critérios de classificação incluíram a avaliação de características como o grau de privacidade de áreas e recintos, ventilação, iluminação, isolamento térmico e métodos de aquecimento, e uma classificação binária foi usada para a avaliação sistemática. Os resultados destacaram que a Casa Taller é uma manifestação de moradia poética na exterioridade do deserto do Atacama, sugerindo uma vocação para atividades comunitárias. As qualidades de iluminação revelaram um projeto estratégico que maximiza a luz natural controlada, usando aberturas e claraboias. Concluiu-se que a casa-ateliê representa uma expressão do "Regionalismo Crítico revisitado". Nessa abordagem, a relação "local-forma" é fundamental, equilibrando a técnica local com o ambiente cultural e natural. Esse trabalho oferece um modelo sustentável para viver em ambientes frágeis, no qual o projeto arquitetônico é devidamente integrado às condições climáticas e culturais do local.

Palavras-chave: projeto arquitetônico, construção em terra, arquitetura tradicional, argila, materiais de construção.

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INTRODUCTION

Magdalena Gutiérrez's relationship with San Pedro de Atacama is profoundly personal and professional. Born in Bolivia, her emotional bond with the region was strengthened by her decision to continue her architectural work in this desert territory after leaving teaching at the Catholic University of the North in 1998, settling with the "Solcor" ayllu in "Calamarca" (Giribas et al., 2023, p 24). Among her projects, the inhabited Workshop House (***Casa Taller***) and its nine-year construction process (1994-2003) stand out, reflecting a dynamic adaptation to the climate and local context.

The selection of the "Workshop House" as a case study came from the review of Magdalena Gutiérrez's projects between 1989 and 2012, based on the compilation of Giribas et al. (2023). 13 works were considered from the 1998-2012 period in San Pedro de Atacama, linked to the local ancestral family structure called Ayllu, which forms an oasis village. Unplanned works and hotels were excluded, as they were not linked to the territory, reducing the number of options to 7 cases. Finally, a list of 5 houses was left, as shown in Table 1 and on the map of Figure 1.

Table 1 shows the works of the period. With the criteria defined below, a few works are part of the architect's most productive stage.

Table 1. List of works by the architect in the 1989 -2012 period. Source: Giribas et al. (2023).

Year	no.	Name of work	Location	Planimetry	Materiality	Status
1989	1	Casa de la Cultura	Conde Duque Ayllu	No	no information	built
1994	2	Casa Dieter	Larache Ayllu	No	no information	built
	3	Kimal Hotel	Conde Duque Ayllu	Yes	adobe, stone, semi-cured mud roof	built
1994	4	Workshop House	Solcor Ayllu	Yes	adobe, stone, semi-cured mud roof	built
1996	5	Takha Takha Hotel	Conde Duque Ayllu	Yes	Adobe	Not built
	6	La Estaka Restaurant	Conde Duque Ayllu	No	no information	built
1997	7	Casa Toro	Solor Ayllu	Yes	adobe, stone, semi-cured mud roof	built
2001	8	Casa Carolina Agüero	Solor Ayllu	No	no information	built
2001	9	Casa Ana Espinoza	Coyo Ayllu	Yes	adobe, stone, semi-cured mud roof	built
	10	Casa Beeris	Conde Duque Ayllu	No	no information	built
2004	11	Casa Esmeralda Ramos	Solor Ayllu	Yes	adobe, stone, semi-cured mud roof	built
2007	12	Casa Nano	Yaye Ayllu	Yes	adobe, rammed earth, semi-cured mud roof	built
2012	13	Casa J.	Solor Ayllu	No	no information	no information

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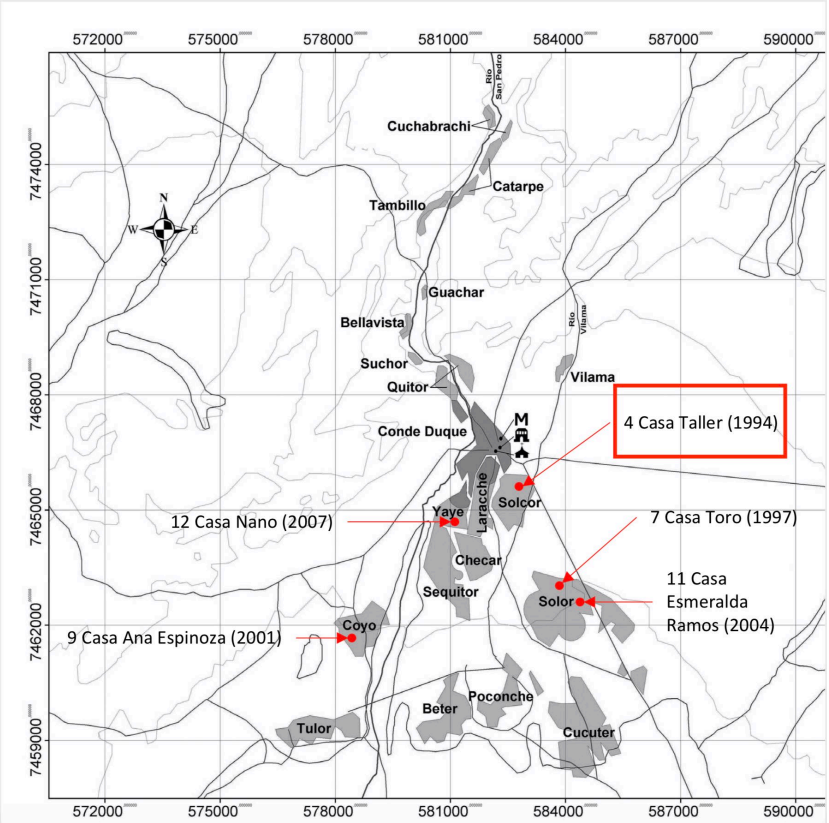

Figure 1. The case study is in the ayllu structure of the San Pedro de Atacama oasis. Source: Adaptation by Raúl José Molina Otárola (2015).

The "Workshop House" was prioritized because it is the oldest work of the analyzed period and is located in a peri-urban sector close to the typical area of the village, a sector that was traditionally an area of orchards and that, for the 1990s, exemplifies the transformation process of the oasis. Its setup differs from the traditional one that, until the 1980s, was associated with a traditional dwelling outside the central hub of San Pedro. The Workshop House exemplifies the layout in the center of the agricultural estate, combining the dwelling with crops, orchards, and fruit trees. However, the complex respected the pre-existence of the woodland and the existing double ditch irrigation system for crops (***melgas***) on the property.

Figure 1 shows the location of the Workshop House in the Solcor ayllu, southeast of the Conde Duque ayllu, which is the typical area and the historical hub of San Pedro de Atacama.

Problematic

Living in fragile environments, such as desert oases, has great challenges. San Pedro de Atacama is a pre-Hispanic oasis dating back to 1000 A.D. and is located in one of the most arid deserts on the planet. The expansion of tourism and urbanization has drastically reduced agricultural land in the last 30 years. According to González (2020), between 1990 and 2018, the agricultural area in San Pedro de Atacama decreased by more than 40%, transforming into urban and tourist infrastructure. This competition for land and water resources

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has impaired traditional agricultural practices and increased pressure on essential services. However, reviewing the vernacular housing offers solutions to face these challenges and preserve ecological cycles in an oasis.

THEORETICAL FRAMEWORK

The link between site, climate, and materials has been established in vernacular architecture using Vitruvius. Moholy (1957), Rudofsky (1965), and Olgyay (1998) related traditional construction to sustainability. Barrada and Tomasi (2020) expanded upon this vision in Latin America, considering vernacular architecture not only in climatic terms but also as a material construction with social and symbolic roles in dialogue with the historical processes of the social groups Barrada (2014). Rafael Serra (2001), in the Spanish edition of Architecture and Climate, highlights how Olgyay looked closely at the interaction between buildings and the natural environment, questioning the norms of the official architecture of the twentieth century Olgyay (1998). Rudofsky (1965) integrated anthropological aspects into the Loren-Méndez (2018) vernacular vision, while Rapoport (1969) highlighted climate as a determining factor. Mileto and Vegas (2014) introduced concepts such as "kilometer zero" and "bio-construction" related to sustainability. In Latin America, Gulá and Navarro (2015) and Toumi et al. (2017) addressed sustainability from a socio-economic perspective, given inequality and poverty. Santacana Juncosa and Mensa Biosca (2022) proposed categories to catalog architecture according to its climate management, redefining the relationship between architecture and climate. Heschong (1979) stressed the "Thermal qualities" essential for choosing activities in spaces and criticized the excessive use of mechanical systems in favor of passive solar houses. Horn (2017) and Santacana Juncosa & Mensa Biosca (2022) defined the "Climate control strategies" and categorizations for architecture. Alfaro, Yuste, and Palme (2023) address "Isolation" and "Cultural Techniques" influencing social behavior and transforming the landscape and climate. Reyner Banham (1984) classified the "Architectural modes of climate management" into "conservative," "selective," and "regenerative" (like Joseph Paxton's Conservative Wall). Finally, Santacana Juncosa and Mensa Biosca (2022) reviewed the conservative mode in depth, distinguishing between isolated, closed, and open systems according to their exchange of matter and energy with the environment.

The study of isolated oases reveals their growth limits and the fragility of their cultural heritage and landscapes. Without buffer spaces, the loss of vegetation and water deeply affects local traditions and culture. This raises questions about sustainability and resources for living. The objective is to extract design principles from a significant work by the architect Magdalena Gutiérrez that allows the formulation of sustainable strategies for contemporary living in fragile ecological environments, taking as context the oasis of San Pedro de Atacama.

Context

Urban expansion in rural areas highlights the need to review the ways of living and the impact they generate on cultural landscapes. It is crucial

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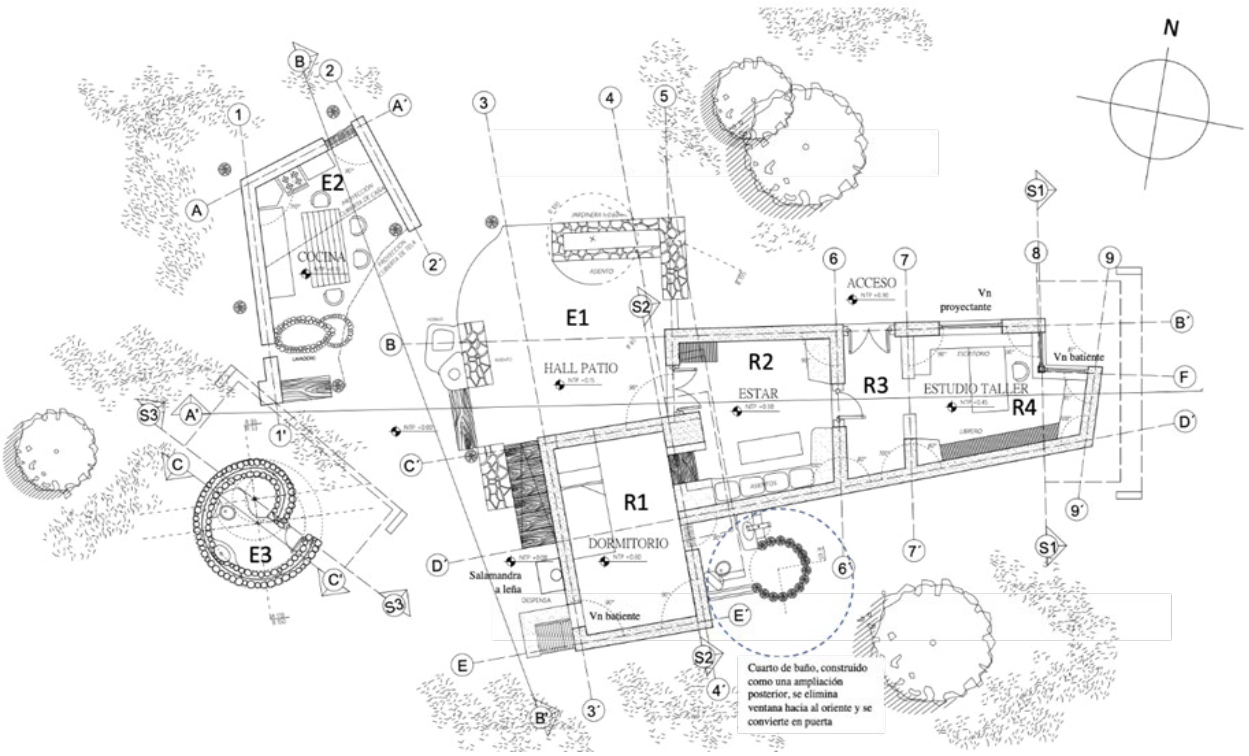

Figure 2. Architectural plan of the "Workshop House". Source: (Caro, Coo, & Roman, 2023)

to promote balanced growth in rural territorial units, which, although traditionally sustainable, are threatened by excessive consumption of resources and energy.

San Pedro de Atacama, in the foothills of Antofagasta (22°55' S, 68°12'W, 2,436 m), is an oasis of the Atacama Desert with a fertile salt flat, shrubby vegetation and endemic forests. Founded as an agricultural settlement, its name in Cunza means "I am going to the village." Archaic societies (4,000-2,000 BC) to sedentary agro-livestock communities (500 BC) took advantage of the ravines and the salt flat's hydrographic system. Located in Andean zone 9 (An) of Chile's climatic zoning, it has high altitude, low temperatures, and high daily thermal variation, with little precipitation and occasional snow.

In Figure 2, the enclosures with the letter (R) refer to indoor and intermediate spaces, while those designated with the letter (E) include outdoor and intermediate spaces.

METHODOLOGY

An approach was used to analyze Magdalena Gutiérrez's "Workshop House," combining architectural and ethnographic analysis based on personal experience. Three stages were used: works selection, conceptual framework construction, and evidence comparison. The Classification Criteria to evaluate the "Workshop House's" spaces are presented in Tables 2 and 3. Three types of spaces were identified: indoor, outdoor, and intermediate, following Glenda Kapstein's categories, which subdivide intermediate spaces into private, public, semi-public, and semi-private

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(Kapstein, 2015, p. 192). Access was categorized according to the degree of restriction, and ventilation, as natural or mechanical. Daylighting was analyzed considering its origin and quality. Thermal insulation was classified as high, medium, or low, and heating methods as active or passive radiation. Each attribute was evaluated with binary values (0 and 1), systematically evaluating the spaces.

DEVELOPMENT AND RESULTS

The results presented in Table 2 analyze the rooms of the Workshop House, subdividing the indoor and outdoor spaces. The surfaces in square meters, equipment, furniture, and access to services such as ventilation and daylight are specified. In addition, aspects such as outdoor and indoor space visibility are quantified. The percentages indicate the distribution of the different types of spaces.

Table 2 shows data from the analysis of the house's attributes, typologies of spaces, ventilation characteristics, sources of daylighting, size of openings, and their orientations.

Tabea 2. Spatial attributes and characteristics of the envelope. Source: Preparation by the Author.

		Space				Access				Ventilation			Daylighting Window size and orientation			58,8	Skylights and/or open screen m2	House windows, walls, and ceilings m2	% fenestration v/s indoor enclosure 10 % surface 10% m2
	Enclosures	Indoor	intermediate	Outdoor	surf. m2	Private	public	semi-public	semi-private	Natural	Artificial	North	Norte	South	East	West			
1	R1 Bedroom	1	0	0	18	1	0	0	0	1	0	0	0	0	0	0,5	1,5	2	11%
2	R4 estudio taller	1	0	0	11	1	0	0	0	1	0	0	1	0	0,75	0	0	1,75	16%
3	R2 Study workshop	0	1	0	36	0	0	1	0	0	0	1	0	0	0	1	0	1	3%
4	E2 Kitchen	0	0	1	9	0	0	1	0	1	0	0	3	9	2	0	9	0	0%
5	R3 Hallway	0	1	0	5	0	0	0	1	0	0	1	1	0	0	0	0	1	20%
6	E1 Hallway Yard	0	0	1	17,5	0	0	1	0	1	0	0	18	0	18	4	17,5	0	0%
7	E3 Open-air bathroom	0	0	1	6,28	0	0	0	1	1	0	0	0	0	0	0,5	6,28	0	0%
totals		2	2	3	102,78	2	0	3	2	5	0	2	23	9	20,75	6	34,28	5,75	
percentages		29%	29%	43%	100%	29%	0%	43%	29%	71%	0%	29%	39%	15%	35%	10%	33%	10%	

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Figure 3. Studio Workshop.
Source: Prepared by the author.

Regarding the size, location, role, and composition of the house's spaces, 43% are located outside, 28.6% are indoor, and the remaining 28.6% are intermediate. However, regarding the size of the enclosure surface areas and their degree of privacy or exposure, the private indoor spaces, namely the bedroom and study workshop, have a surface area of 29 m^2. The semi-public intermediate spaces, considered transitional spaces that include the yard's hallway, the kitchen, and the living room, the latter inside the housing, together total 62.5 m^2. In the category of semi-private spaces, the outdoor open-air bathroom and the hallway inside the house and between the study workshop and the living room are considered; both total 11.28 m^2.

a) Lighting of Indoor Spaces

In the 18m^2 Bedroom (R1), a fenestration of 2.25 m^2 is observed, with a window to the west and a skylight that represents 11% of the enclosure's total surface. The skylight provides direct light through a narrow north-facing opening, optimizing daylight on a south-facing wall and avoiding overheating, which reduces the need for artificial light during the day. In addition, a north-facing skylight illuminates the transition between the bedroom and the living room, improving the visibility of the three steps. The 11m^2 Study Workshop (R2) (Figure 3) has an east-facing 1.75 m^2 window (16% of the area) to take advantage of the morning light and avoid the extreme heat of the afternoon, offering optimal conditions for work. The low, horizontal north-facing window controls light rays and prevents overheating. In the 36m^2 living room (R3) with 1 m^2 of windows (2.7% of the area), the lack of north-facing openings allows an

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Figure 4. Outdoor kitchen, intermediate space. Source author.

Figure 5. Lowered yard. Source: Prepared by the author.

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exposed wall to capture and release heat during the day. Although it receives intense light from the west in the afternoon, the skylight connects with the bedroom and improves the lighting, creating a cozy atmosphere at the end of the day.

Figure 3 shows the lighting qualities. The central opening is oriented towards the sunrise and the Likancabur volcano, while the north-facing window runs at desk height.

b) Lighting of the Intermediate Spaces

The 9m^2 Kitchen (R4) (Figure 4), located in the outdoor space, has 1.5 m^2 of window cover, equivalent to 17% of its surface. This kitchen benefits from its south-facing position, providing indirect and constant light without the excess heat of the direct sun and ensuring good ventilation and clarity during food preparation, which makes it functional and safe. On the other hand, the 4m^2 Hallway (R5) has 0.4 m^2 of window cover (10% of its surface) and acts as a transition area.

In Figure 4, a north-facing "L" shaped adobe wall is shown at the back of the space, leaving the activities against the light and receiving indirect lighting through the south opening.

b) Outdoor Spaces

The Yard Hallway (R6), with an area of 17.5 m^2 and 1.75 m^2 of windows (10% of the area), acts as a connection and circulation area and has adequate daylighting. This north-facing space allows soft and constant light, facilitating the transition between indoor and outdoor spaces in a climate where sunlight is exceptionally intense. On the other hand, the Open-Air Bathroom (R7), with 6.28 m^2 and 0.75 m^2 of windows (12% of the area), faces North or East, optimizing ventilation and daylighting and improving hygienic and comfort conditions. The bathroom design, with a circular wall against the prevailing southwest wind, prioritizes the direct entry of the sunlight and protects the space from the wind.

In Figure 5, the light quality of this space is complemented by fabrics and nets that generate an even light outside. The photo shows the celebration of the open workshop "Building with Earth 2."

The ventilation, the wind direction, and the characteristics of the walls were evaluated, considering their insulation or energy capture capacity. Daylighting was classified according to its origin: windows, walls, or skylights, with or without filters. Additional heating was also examined, differentiating between active and natural passive radiation heating with semi-cured mud roofs. As for ventilation, 5 of the house's 7 spaces have direct natural ventilation with the outside. However, the living room and hallway do not have ventilation through windows; the air renewals are through glazed doors.

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Figure 6. Workshop House North Facade. Source: Preparation by the Author.

The material analysis (Figure 6) addressed the thermal capacity of the walls, ceilings, and enclosures, as shown in Table 3. The house, with an elongated east-west volume, has 30% of its walls facing north, 57.26 m^2, 30% south, 57.81 m^2, 16% to the East, and 24% to the West. 86% of the spaces have 45 cm thick adobe walls, and 29% have a 0.50 m wide "dry" stone wall around the outdoor bathroom. The window coverage is minimal: only 8.73% of the north-facing walls have windows, and the south walls are opaque. 50% of the rooms (bedroom, study, living room, and hallway) have high thermal insulation, thanks to approximately 15 cm thick adobe walls and semi-cured mud ceilings on wooden and cane structures.

The work can be seen in Figure 6, with the Likancabur volcano in the background and different materials: boulders on the furniture, split boulders on the floor, and liparite stone for the planters. The adobe north wall runs alongside the mud roof. The reed shading beside the materials connects with the oasis's vegetation context.

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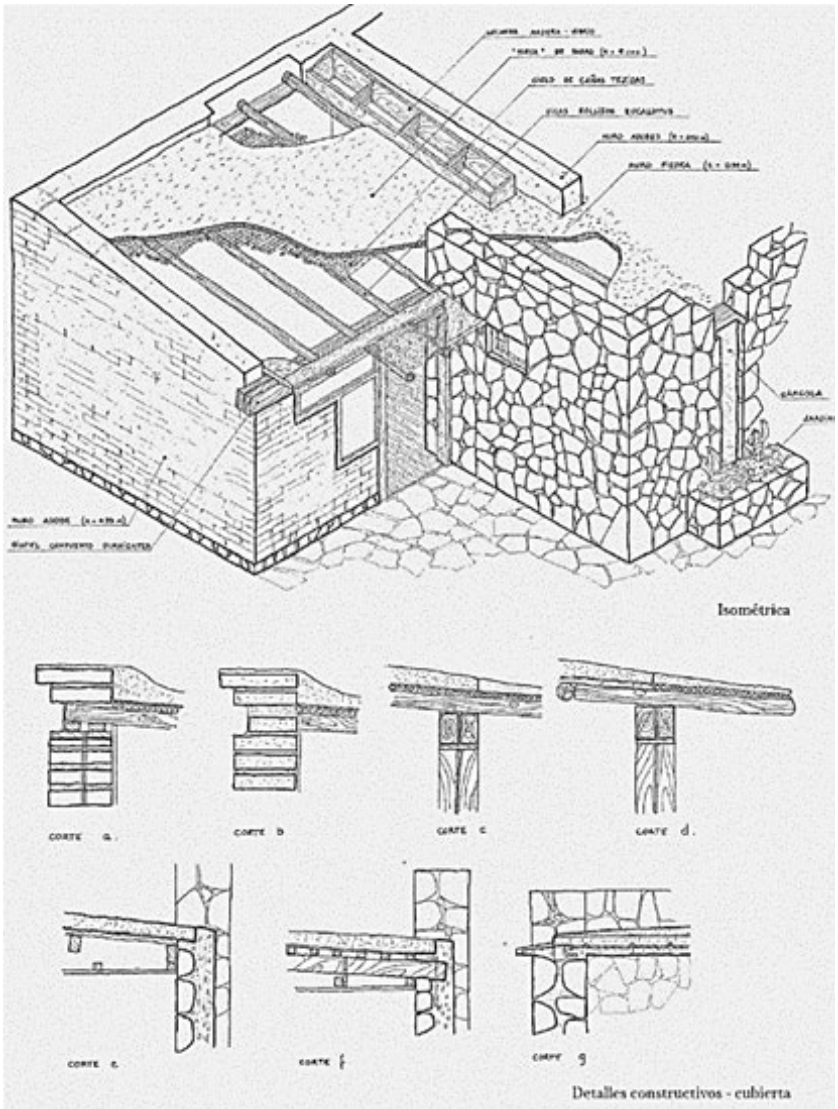

Figure 7. Hotel Kimal isometric construction. Source: Giribas et al. (2023).

Figure 7 shows the isometric construction of the Kimal Hotel. Work started the same year as the Workshop House and shows the earthen roof and the inclusion of skylights. Both works are different in the meeting between the wall and roof. These details demonstrate the concerns of the relationship between materials.

Table 3 shows the data for analyzing the house's attributes through its enclosures and indoor, outdoor, and intermediate spaces. It considers the analysis of the materiality of the walls, the orientation and surface of walls, the degree of thermal insulation, and heating for each enclosure or space.

The outdoor kitchen has medium thermal insulation, with walls that act as a barrier against the wind and a reed roof that is permeable to wind and rain. The yard's hallway, running alongside the house and with a fabric roof, has low thermal insulation. As for the heating, 50% of the rooms take advantage of passive radiation from the north, namely the bedroom, the

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		Materiality of Walls		Walls (m2 length and orientation)			190,3	High Thermal Insulation		Medium Thermal Insulation		Low Thermal Insulation		Heating	
	Recintos	Adobe 0,45 m	Stone 0,50 m	North	South	East	West	Barrier Wall	Barrier Roof	Barrier Wall	Barrier Roof	Barrier Wall	Barrier Roof	Passive Radiation	Active Radiation
1	R1 Bedroom	1	0	9	9	6	18	1	1	0	0	0	0	1	1
2	R4 estudio taller	1	0	17	18	6	0	1	1	0	0	0	0	1	0
3	R2 DEN	1	0	11,46	11,01	6,9	4,8	1	1	0	0	0	0	1	0
4	E2 Kitchen	1	0	9	0	5	15	0	0	1	0	0	1	0	0
5	R3 Hallway	1	0	4,8	4,8	0	0	0	1	0	0	1	0	0	0
6	E1 Hallway Yard	1	1	0	9	0,5	1	0	0	1	0	0	1	0	1
7	E3 Open-air bathroom	0	1	6	6	6	6	1	0	0	0	0	1	1	0
	totals	6	2	57,26	57,81	30,4	44,8	4	4	2	0	1	3	4	2
	percentages	86%	29%	30%	30%	16%	24%	50%	50%	33%	0%	16%	50%	50%	33%

Table 3. Physical attributes of the envelope, materiality, and thermal insulation. Source: Preparation by the Author.

living room, the hallway, and the study workshop. The bedroom also has an outdoor west-facing salamander heater, while the yard's hallway has a clay oven that uses coal or wood as a heat source.

DISCUSSION

The "Workshop House" design focuses on integrating with the environment through volumes and intermediate spaces that facilitate indoor and outdoor space use (Giribas et al., 2023). Adapted to the extreme conditions of the desert, it uses small volumes and sloping roofs for shelter (Benavides, 1988; Šolc, 2011; Jorquera, 2022). It uses local elements such as yards and hallways, applying climate design strategies. The orientation of the adobe walls, windows, and vegetation contributes to thermal management, providing warmth and coolness. The adobe walls have densities between 750 kg/m^3 and 2000 kg/m^3, while the industrialized materials vary between 1300 kg/m^3 and 2400 kg/m^3 (Cuitiño et al., 2020). To achieve high thermal resistance in the climatic zone 9 An, according to the National Institute of Standardization (2008), it uses traditional materials such as earth and straw with cane on the roof, reaching thermal resistance values of R100=386. Regarding the thermal properties, several studies have been established as a reference to know the properties of mixed construction systems that use soil and lightened straw as insulation, coatings, or filling mass in wall

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partitions or roofing. In this regard, it is necessary to highlight the previous research of Weiser et al. (2020), Volhard (2016), and Vinceslas et al. (2019).

The roof, with an 8 cm layer of "semi-cured mud," protects against intense radiation and desert rains (Serrano, 2019, p. 102). This thick layer of mud delays and transfers solar radiation, contributing to the energy efficiency of the day/night cycle (Palme, 2014). The thermal conductivity of the lightened mud is 0.30 W/mK, the adobe is 0.95 W/mK, and the solid mud is 1.60 W/mK, with thicknesses from 0.074 m for the clay/cane (***quincha***) to 0.35 m for the adobe, (Cuitiño et al., 2020).

The "Workshop House" illustrates Reyner Banham's "Architectural modes of climate management," encouraging a fluid interaction between indoor and outdoor spaces, adapting to day and night variations. It uses an active thermodynamic approach, incorporating the "intermediate space" concept by Glenda Kapstein (2015) with corridors, hallways, and vegetation in time-spatial sequences. Thermal analysis, based on Heschong (1979), manages warmth, dryness, radiation, and coolness: warmth is controlled with orientation and materials that capture solar heat, dryness by natural ventilation, radiation with skylights and design, and coolness with thermoregulatory and bioclimatic materials. The Conservative Mode uses massive structures, the Selective Mode uses natural filters, and the Regenerative Mode uses heat sources, such as a salamander heater and a clay oven. This study underlines the relevance of vernacular and sustainable architecture, fusing tradition and modernity in the relationship between climate, construction, and inhabitants.

CONCLUSIONS

In the "Workshop House" of Magdalena Gutiérrez, several significant conclusions can be drawn that integrate aspects related to the revaluation of earth architecture, energy efficiency, passive energies, and learning about the Atacamenian way of living and building. These aspects offer important guidelines for the study and architecture related to bioclimatic adaptation.

This work is a clear example of how earth architecture has been revalued in the contemporary context. Using traditional materials such as adobe, stone, recovered local woods, and natural fibers such as cane and straw, the work stands out for its ability to integrate harmoniously with the natural environment of the oasis when considering its mode of implantation concerning the pre-existing trees. This revaluation not only preserves ancestral construction techniques but also aligns with principles of sustainability and low environmental impact, which are crucial aspects of today's architecture.

The "Workshop House" design incorporates innovative energy efficiency strategies and the use of passive energies. Firstly, passive climate

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control is achieved by arranging openings and skylights that allow maximum use of daylight, reducing the need for artificial lighting and preventing overheating, which is crucial in the Atacama desert climate. Secondly, the house is designed to take advantage of cross ventilation, which helps maintain a comfortable indoor temperature without needing mechanical air conditioning systems. Finally, the ground-based construction materials provide excellent thermal insulation, keeping the interior cool during the day and warm at night, a necessary adaptation in environments with high daily thermal variability.

Technologically, it is not limited to replicating traditional techniques; it adapts them to meet contemporary needs. This is reflected through the use of semi-cured mud on log structures and the incorporation of horizontal spans, without weakening the full and empty relationship so crucial for earthquake resistance, allowing us to understand light differently than the vernacular form. This shows how ancient ways of living and building are linked to nature and the landscape, which offer sustainable and adaptive solutions. The "Workshop House" reflects a balance between local techniques and the cultural and natural context, being an exemplary contribution of "Critical Regionalism revisited," as Foyo and González (2023) discuss.

In summary, poetic living in the San Pedro de Atacama oasis context is reflected in the revaluation of earth architecture, the implementation of energy efficiency strategies, and the learning of traditional ways of living, which provide significant guidelines for sustainable architecture. This work not only preserves cultural and ecological heritage but also offers a viable model for living sustainably in challenging contexts. This integrative and adaptive approach is crucial to facing the contemporary challenges of urbanization and climate change, underlining the need for bioclimatic adaptations in architecture.

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