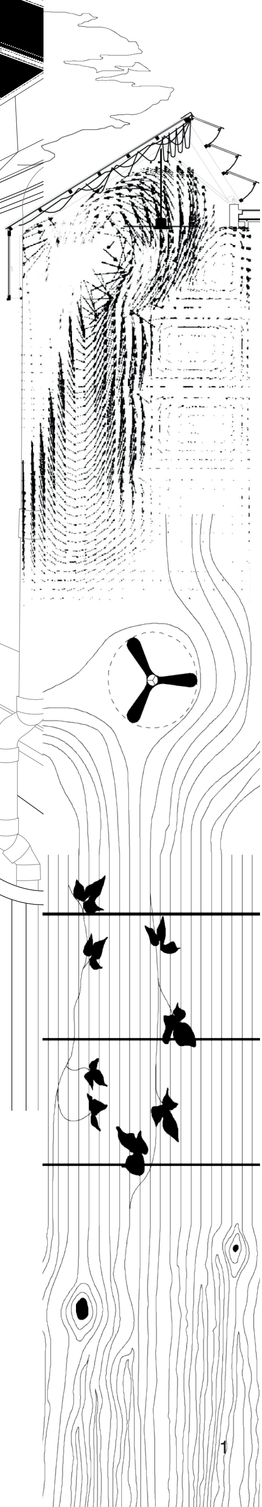


habitat and comfort

architectures of the air

EPFL SS25

PERIS+TORAL DESIGN STUDIO
MARTA PERIS JOSE TORAL assistant LARA GIORLA

SUBJECT: SUSTAINABLE HABITAT

In the context of a climate and housing emergency, a sustainable habitat must consider the minimum space per person, seeking a balance between comfort and efficiency in resource use, while minimizing the excessive consumption of energy and materials. Although there is not yet complete consensus, this minimum surface area per person is estimated to be 30m^2.

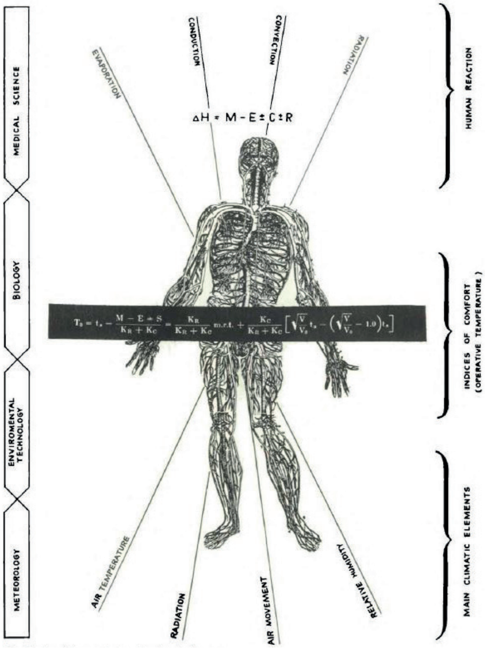
To maintain quality of life, one way to compensate the reduction in space is by sharing common areas. This course addresses habitat as the starting point for a collective and cooperative living, approaching it as a broader spectrum than housing as a private space, exploring forms of coexistence based on mutual support that promote solidarity and a sense of community belonging.

New approaches to space sharing will be explored, adopting various scales of cohabitation, as not all functions can be shared by the same number of people.

The initial scale of cohabitation is proposed ***within each dwelling***, employing the cluster typology to critically evaluate the minimum necessary personal space. The aim is to reduce individual space in order to expand communal areas. Each dwelling is envisioned as a cohabitation unit with independent access, consisting of a shared area and multiple housing units that correspond to private spaces.

Outside the dwelling, another scale of cohabitation emerges, involving a larger number of individuals and corresponding to collective spaces. Beyond circulation areas (common spaces), this collective program may include a multipurpose room, children's room, library, laundry, satellite apartment, workshop room, and urban garden, among other potential uses. These are a set of spaces that foster social interaction and build a sense of community. The strategic placement of these collective zones can influence pathways and dynamics within the complex, activating and enhancing social encounters and community life. The possibility of opening some of these areas, such as the multipurpose room, to the public realm explores the opportunity to establish connections with the social structure of the neighbourhood.

VICTOR OLGYAY, DESIGN WITH CLIMATE 1962

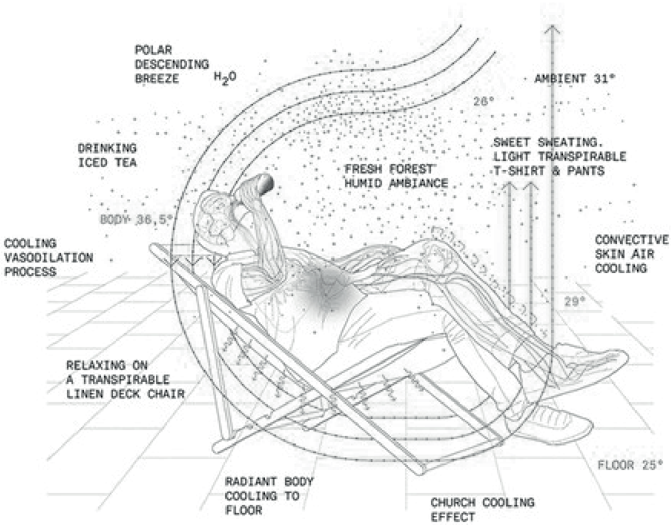


living in comfort

This design studio proposes comfort as the main issue in the design of the collective habitat. Discussing comfort places the inhabitant and his body, along with their interaction with the environment, at the centre. The body is no longer thought of as an isolated and separate entity but as connected and linked to the world. This interaction takes place through the air.

design with air

Invisible, almost immaterial, air could be considered the least architectural of the four elements. However, architecture is essentially habitable air that is conditioned to be filled with cultural meanings. The functions of air are many. Like water, it acts as an elemental fluid; like earth, it can become an insulating element; and like fire, it can make environments uninhabitable. Hence the importance of studying strategies to control air in order to put it at the service of human life.



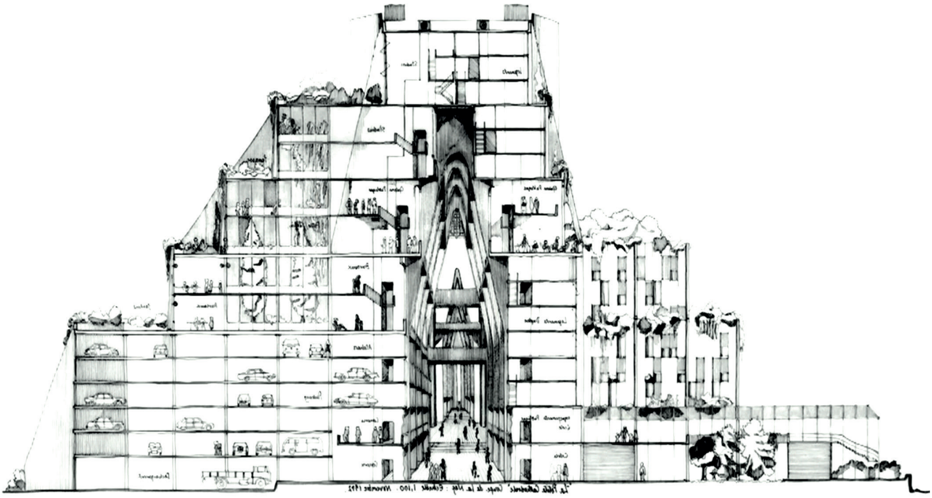
arranging matter

The aim is to develop a design that effectively integrates the statics of materials with the thermodynamics of air, both essential elements for significantly improving the comfort of spaces. Solid matter not only arranges and shapes fluid matter but also interacts with it according to the properties of the materials, thereby regulating environments thermally and hygroscopically, attenuating noise, and facilitating processes such as air convection.

climate responsive habitat

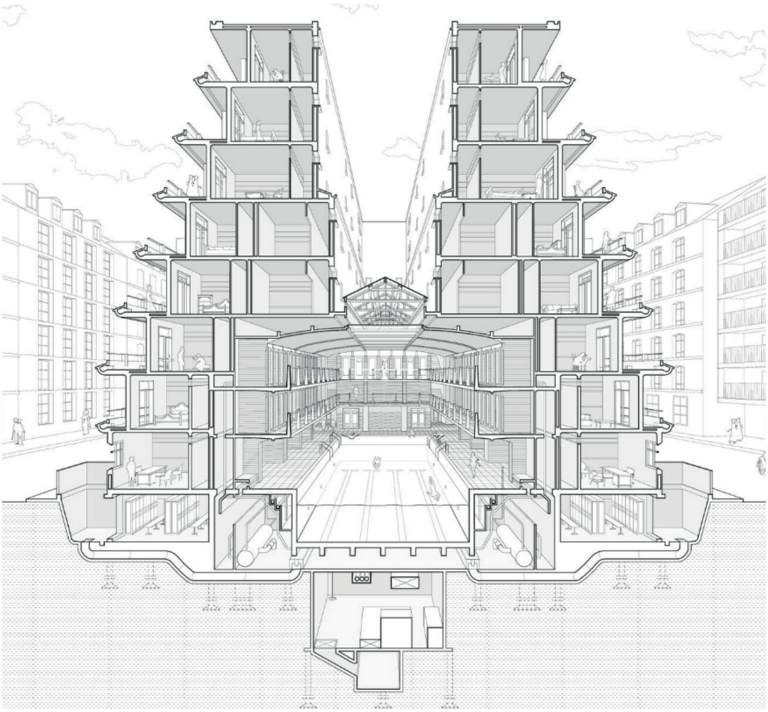
This approach allows the adaptation of the habitat to the environment and incorporates the natural cycles of the seasons by transforming external conditions such as temperature, relative humidity, and air velocity through the design of passive systems. Factors such as the geometry of the space, solar radiation, the presence of vegetation, solar protection, and, most importantly, the openings that create air inlets and outlets, will be decisive in designing this active void and the resulting microclimate.

RICARDO BOFILL - PETITE CATHEDRALE - CERGY PONTOISE 1971



domestic monumentality

The studio conceives this active void as a necessary volume of air that is no longer residual or simply the negative of the built space, but has its own consistency, is designed with other laws - the laws of thermodynamics - and acquires a common dimension, which escapes the human scale to achieve energy efficiency. We are talking about a kind of monumentality inscribed in domestic architecture. This internal spacing offers the opportunity to renaturalise the interior of buildings through plants, trees and bushes that improve air quality and encourage contact with life and nature. This contact has been shown to reduce stress, improve mood and contribute to people’s mental and emotional health and well-being. Rethinking circulation spaces as biophilic environments changes the prevailing perspective: they are no longer spaces to be cared for but spaces that care for us.



social condenser

The recognition of interdependence and the impossibility of being an autonomous and self-sufficient individual lead to a relearning of how to view the world—not from the narrow and focused perspective of an individual, but through the eccentric lens of shared, communal life. These bioclimatic spaces, strategically placed in relation to the building's circulation flows, also provide a social return. Being situated near inhabited areas, they foster sociability over anonymity and act as social condensers.

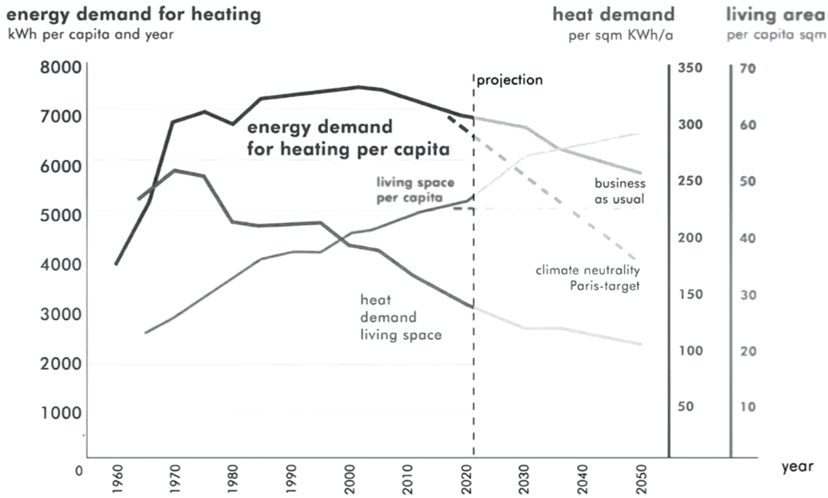
shared habitat

The study focuses on these interstitials areas around the house to explore the social and environmental potential of these transitional bioclimatic spaces, capable of reducing energy demand and generating mutually supportive environments that foster relationships between people. The tempered and bioclimatic condition of these spaces allows us to rethink the house from its internal limit and to review dualities such as interior/exterior, private/communal, owned/shared, open/closed to incorporate other forms of contemporary life in a shared habitat.

ways of living

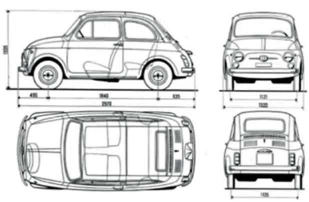
jevons paradox

Currently, the focus on efficiency as a sustainability strategy has led to a situation where, despite dwellings are becoming more efficient per square meter, the overall consumption of resources has not diminished. This phenomenon is known as the Jevons Paradox, in which improvements in efficiency per square meter result in increases in floor area per person, thereby maintaining overall consumption levels. In response, the course syllabus shifts its focus from efficiency to sufficiency in population density, setting a maximum allowable space of 30 m^2 net per person and defining the minimum number of users per project by dividing the gross area by 40m^2.

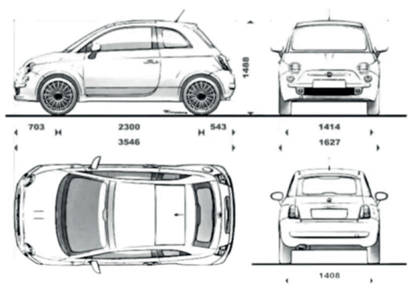


CORRELATION BETWEEN LIVING AREA, HEATING DEMAND PER CAPITA AND HEAT DEMAND PER sqm OF LIVING AREA

REBOUND EFFECT



1957: Fiat 500 R
Length: 2970mm
Displacement 500 cc
Power 13.5 hp (9.9 kW)
Top speed 85 to 105 km/h
Empty weight: 470 kg
fuel consumption comb. 4.5L/100km



2007: Fiat 500 0.9 8V TwinAir Start&Stop
Length: 3550mm
Displacement 875 cc
Power 85 hp (63 kW)
Top speed 173 km/h
Empty weight: 1005 kg
fuel consumption comb. 4.5L/100km

EN GRAND

“HABITER AU MI~~NIMU~~M”:

PARTAGER

RÉ~~DUIR~~E ESPACE

PARTAGER

RÉ~~DUIR~~E CONFORT

PARTAGER

RÉ~~DUIR~~E QUALITÉ

PARTAGER

RÉ~~DUIR~~E LUXE

sharing

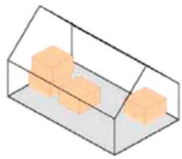
To ensure quality of life is not compromised, the reduction in net surface area per person can be offset with shared spaces. To achieve this, each unit could either transfer more private space to the shared spaces or share it with more users. The course syllabus encourages rethinking the various scales of cohabitation, acknowledging that not all functions are suitable to be shared by the same number of users. Sharing can occur at a cluster level, across a floor plan, or throughout the entire building. Consequently, the more space that is shared, the larger the living areas available the users can enjoy. The aim is to match or exceed current standards in a sustainable way.

Minimum net surface areas for private units

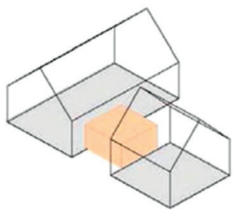
- 20 m² for one person (one room)
- 35 m² for two people (two rooms)
- 50 m² for three people (three rooms)

All units will include a bathroom and a kitchenette.

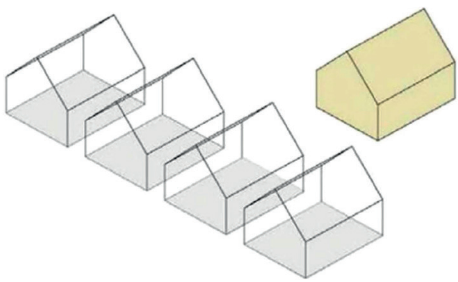
scales of sharing



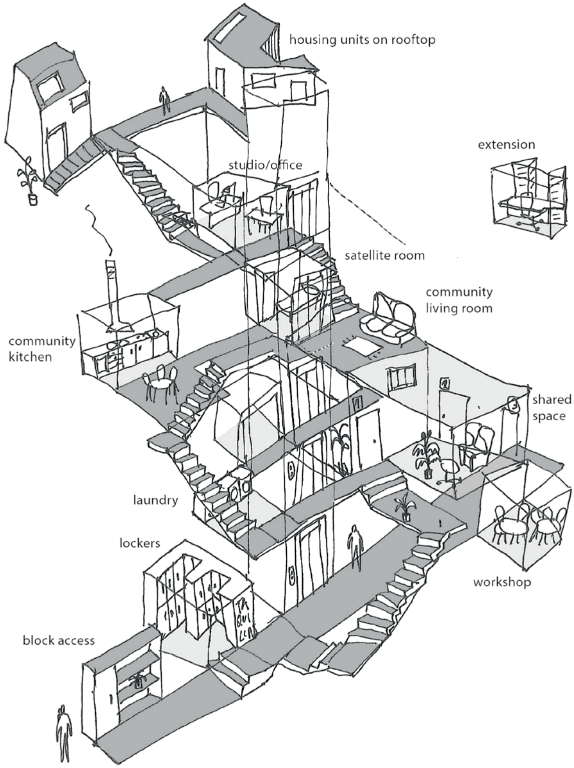
housing unit



agregation



building

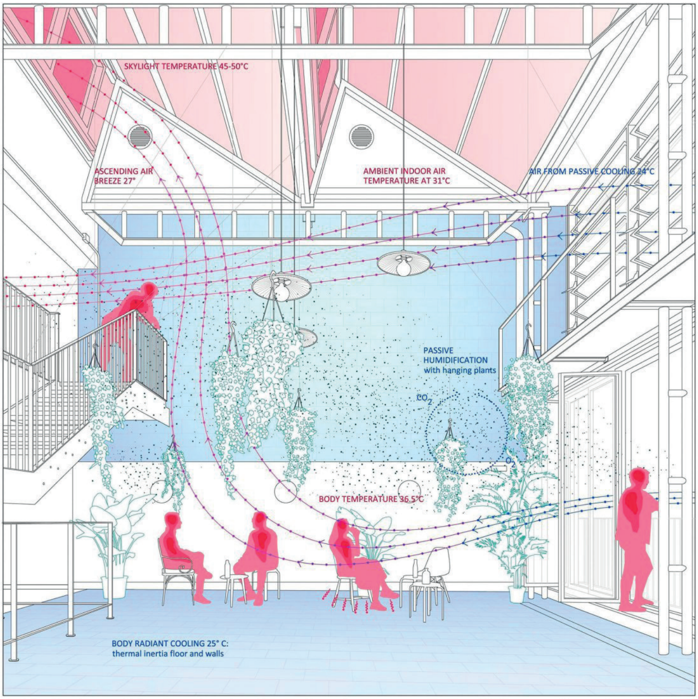


spatial mechanisms

Spatial mechanisms could be incorporated into the typologies to help perceive the spaces as larger than they are. This can be achieved through the implementation of double circulations, diagonals, interconnected rooms or multiple access points. These features endow housing with contemporary attributes such as porosity, de-hierarchisation, indifferentiation, inclusivity and flexibility.

biophilia

On the other hand, it is recommended to explore living arrangements in common spaces that foster human interactions beyond the private unit. Organize shared spaces strategically to encourage encounters and redesign transition areas as biophilic environments that promote engagement with life and nature.



JAVIER GARCIA GERMAN, 159 VPO CARABANCHEL 2022

bioclimatic strategies

In contrast to a regulatory framework that promotes only mechanical efficiency and active systems using renewable energy, the collective dimension of these intermediate spaces enables the implementation of environmental and thermodynamic strategies. These include designing buildings with bioclimatic courtyards and atriums that modify the building's form factor and passively lower energy demands. Today, we have the capability to measure, quantify, and simulate fluid dynamics and analyse various parameters to ensure comfort.

ways of building

climate specificities

Each student will be assigned a specific climate for analysis, which will play a critical role in future projects of the studio. Each student will work with a different climate, delving into its unique environmental conditions, energy requirements, and natural resources. The characteristics and impact of these climates will be thoroughly examined. Furthermore, the study will extend to sustainable building methods suited to each climate, aiming for a comprehensive understanding of the construction systems associated with different environmental conditions. This accumulated knowledge will lead to the creation of a climate atlas, which will be shared among all students.

+ sustainability
+ transmittance
+ inertia
+ phase shift
+ life cycle analysis
+ cost
+ biophilic
+ atmosphere
+ thermodynamic
+ bioclimatic

form, material and climate

The approach involves working within a paradigm where form responds to both material and climate, considering performance, thermodynamics, and biohabitability. By integrating climate considerations, architectural solutions can be optimized for environmental conditions and energy efficiency.

To ensure the efficiency and sustainability of these architectural solutions, it is proposed to quantify factors such as transmittance, inertia, thermal lag, life cycle analysis, and cost, using simulation measurement methods. Additionally, assessing the impact of climatic factors on these parameters will lead to more resilient and adaptive designs.

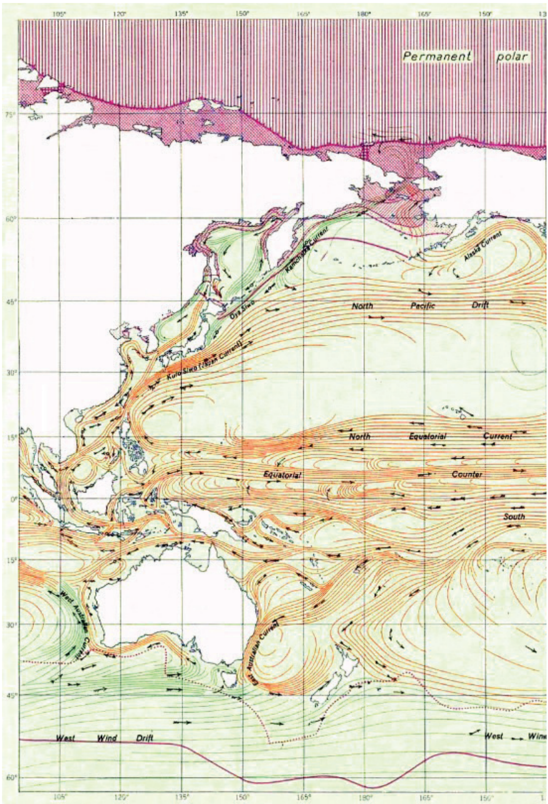
This dual-focus approach aims to create structures that not only leverage the inherent properties of materials but also harmonize with the surrounding climate, enhancing overall sustainability and comfort.

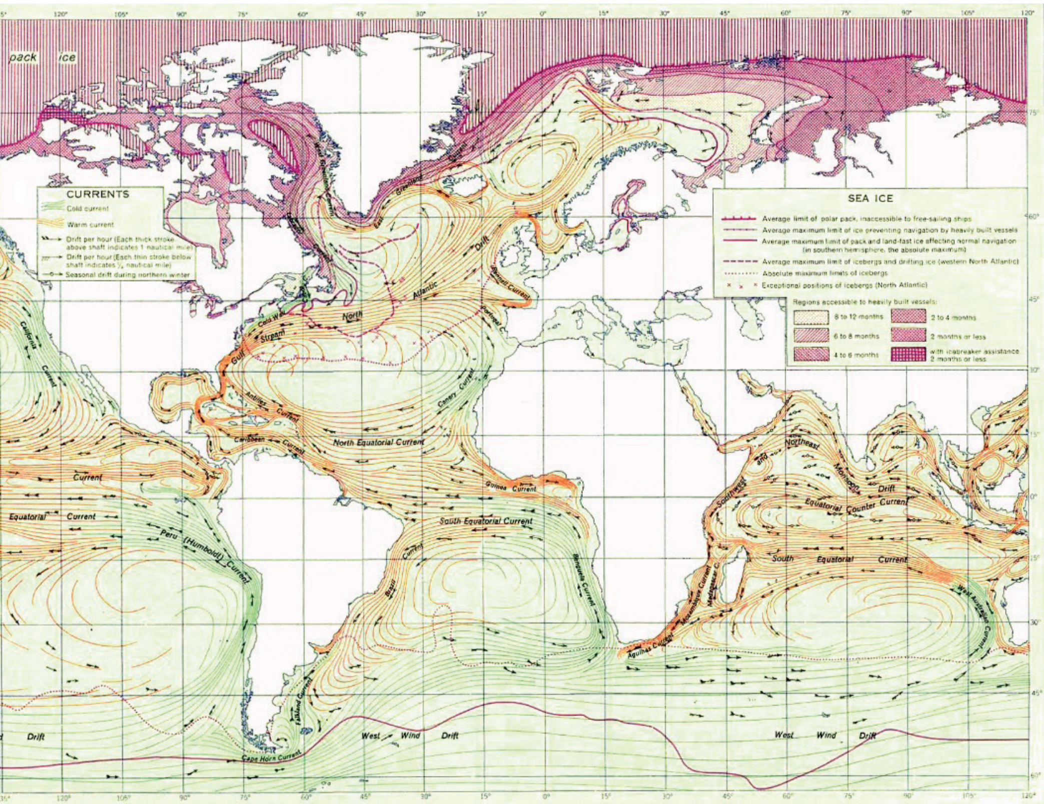
climate as site

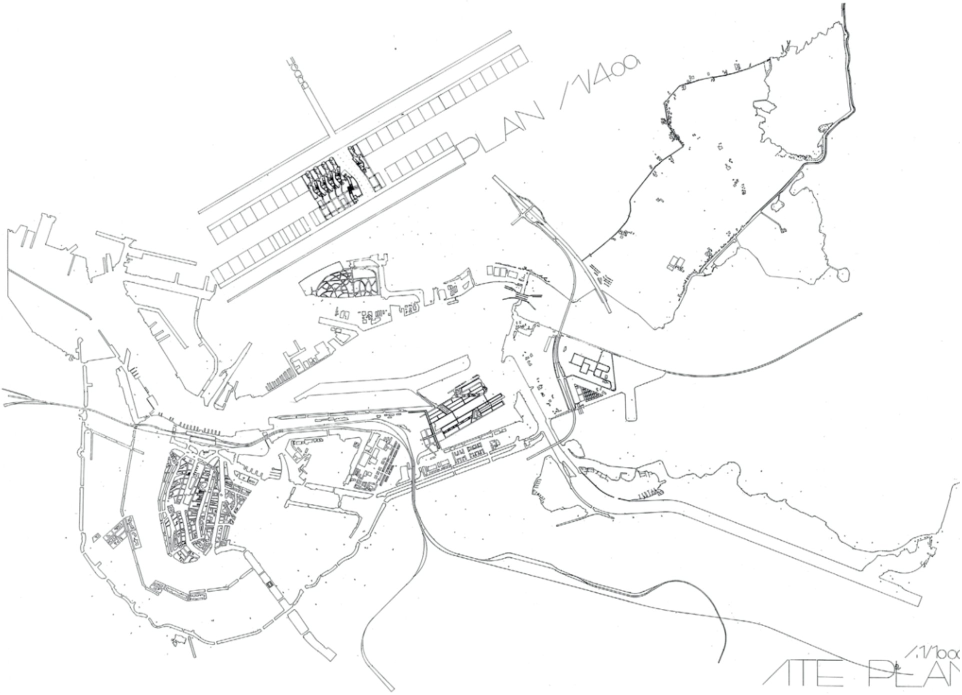
The aim of this semester, is to explore how climate shapes architecture. Consequently, instead of selecting a specific physical site, we will engage with a conceptual grid that represents a non-place, thereby emphasizing the importance of adapting to the climate.

We will define five distinct scenarios, each representing a climate type according to the classification by the Russian-German climatologist Wladimir Köppen: Tropical (A), Arid (B), Temperate (C), Continental (D), and Polar (E). Groups will be formed, with each focusing on a specific climate. Using climate charts, we will analyze temperature, humidity, precipitation, and air movement to understand the challenges each climate presents.

Additionally, we will examine the mechanisms and strategies of traditional vernacular architecture across different cultures, aiming to achieve comfort and effective adaptation to various climates.. This analysis will culminate in the creation of a climate atlas, which will provide the groups with an in-depth understanding of the various architectural solutions developed to address climatic challenges. Thereafter, each group will specialise in a specific bioclimate and design an architectural space adapted to the climatic conditions of their assigned bioclimate. In this way, the groups will have the opportunity to explore and understand various bioclimatic design strategies, based on the climatic conditions characteristic of each region.



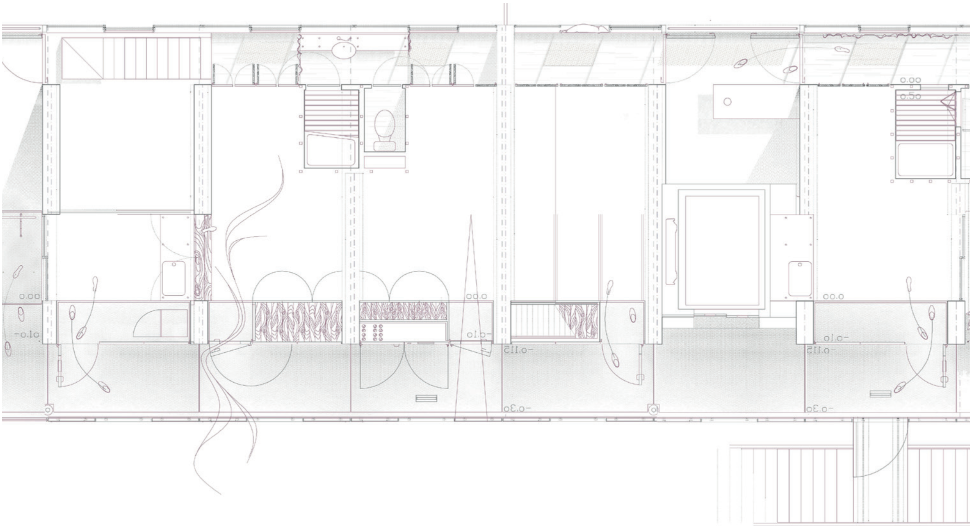

pack ice
CURRENTS
Cold current
Warm current
Drift per hour (Each thick stroke above shaft indicates 1 nautical mile)
Drift per hour (Each thin stroke below shaft indicates ½ nautical mile)
Seasonal drift during northern winter
SEA ICE
Average limit of polar pack, inaccessible to free-sailing ships
Average maximum limit of ice preventing navigation by heavily built vessels
Average maximum limit of pack and land-fast ice affecting normal navigation (in southern hemisphere, the absolute maximum)
Average maximum limit of icebergs and drifting ice (western North Atlantic)
Absolute maximum limits of icebergs
Exceptional positions of icebergs (North Atlantic)
Regions accessible to heavily built vessels:
8 to 12 months
6 to 8 months
4 to 6 months
2 to 4 months
2 months or less
with icebreaker assistance 2 months or less
California Current
Gulf Stream
North Atlantic Drift
Canary Current
Antilles Current
Caribbean Current
North Equatorial Current
Guinea Current
South Equatorial Current
Equatorial Current
Peru (Humboldt) Current
Brazil Current
Benguela Current
Falkland Current
Cape Horn Current
West Wind Drift
Agulhas Current
Northeast Monsoon Drift
Equatorial Counter Current
South Equatorial Current
West Australian Current



2000 EMBT ENRIC MIRALLES - SIX HOUSING IN BORNEO

AMSTERDAM 2000

Each group of students will work on a different site from the various adjacent sites in the superblock, each characterised by different conditions, including new construction, extensions and the reuse of disused space. It will begin with a site analysis and should conclude with a group model and site plan explaining the relationship of each proposal to its context through different scales..

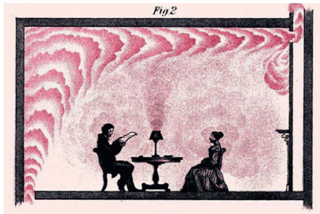


KAZUJO SEJIMA, GIFU KITAGATA APARTMENT SOCAL
HOUSING 1998

The document will focus on cluster typology with shared spaces at various scales of cohabitation, shifting the emphasis from reflection on dwelling to the transition between private and common spaces, rather than studying them separately.

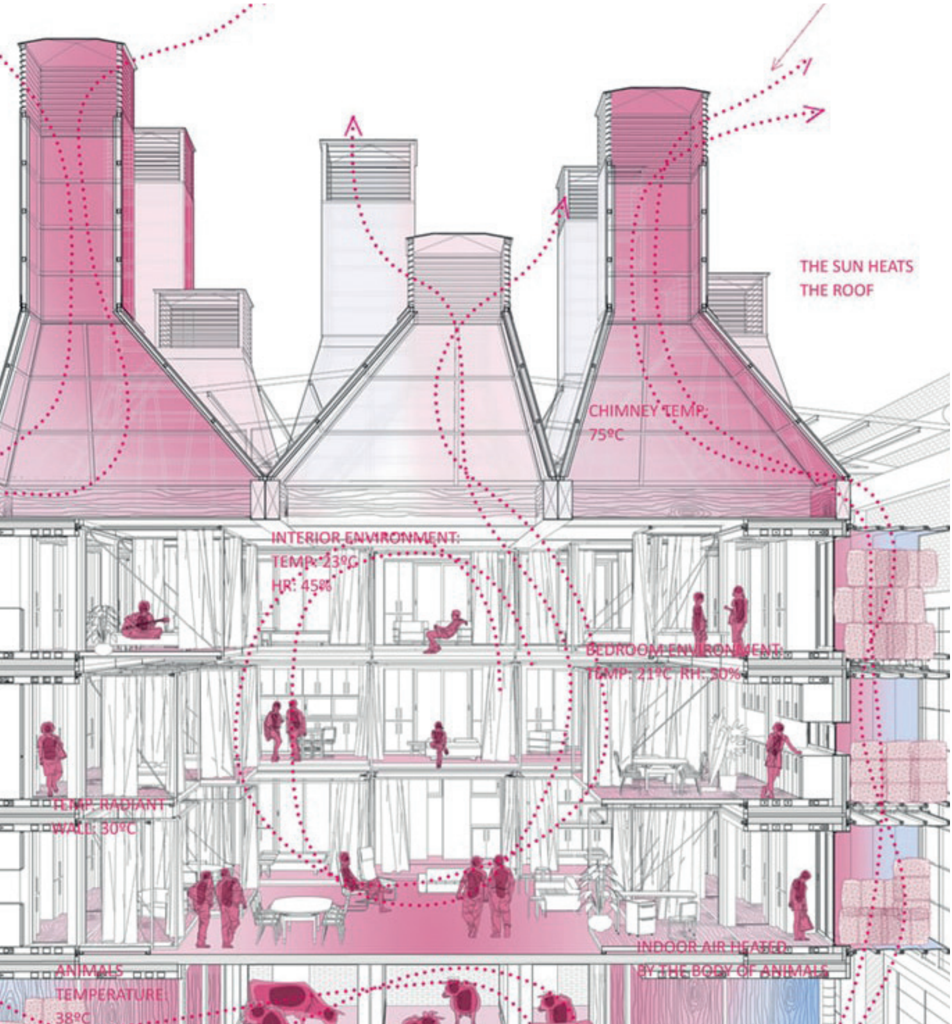
#4 thermodynamics

This involves developing a perspective section that considers the thermodynamic operation of the building and its behaviour in both summer and winter. The representation will include fluids and comfort parameters such as temperature, relative humidity, air velocity, and thermal inertia.

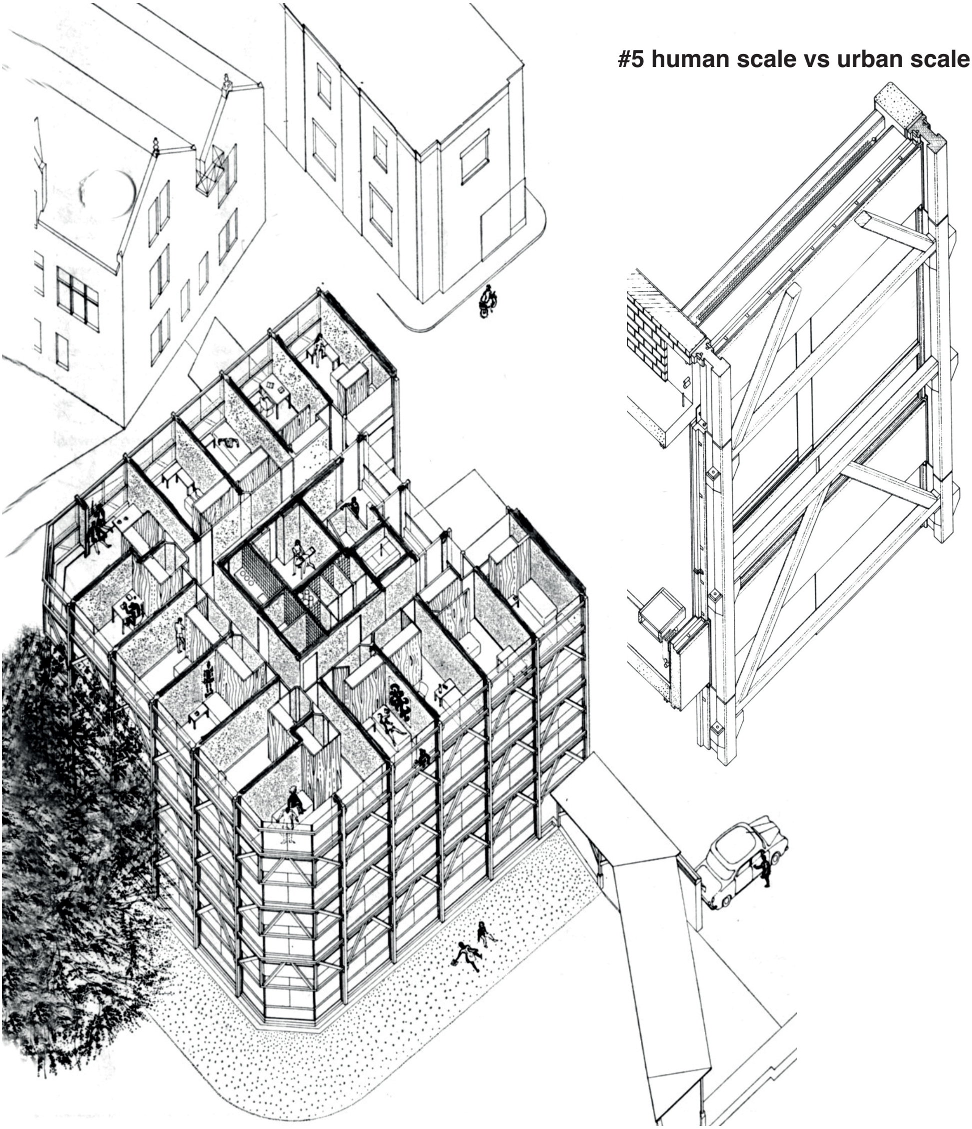


LEWIS LEEDS, LECTURES ON VENTILATION, 1869

JAVIER GARCIA GERMAN, CLIMATIC TYPOLOGIES 2020



#5 human scale vs urban scale



A constructive axonometry of the project that explains the relationship between the chosen construction system, human scale and urban scale.

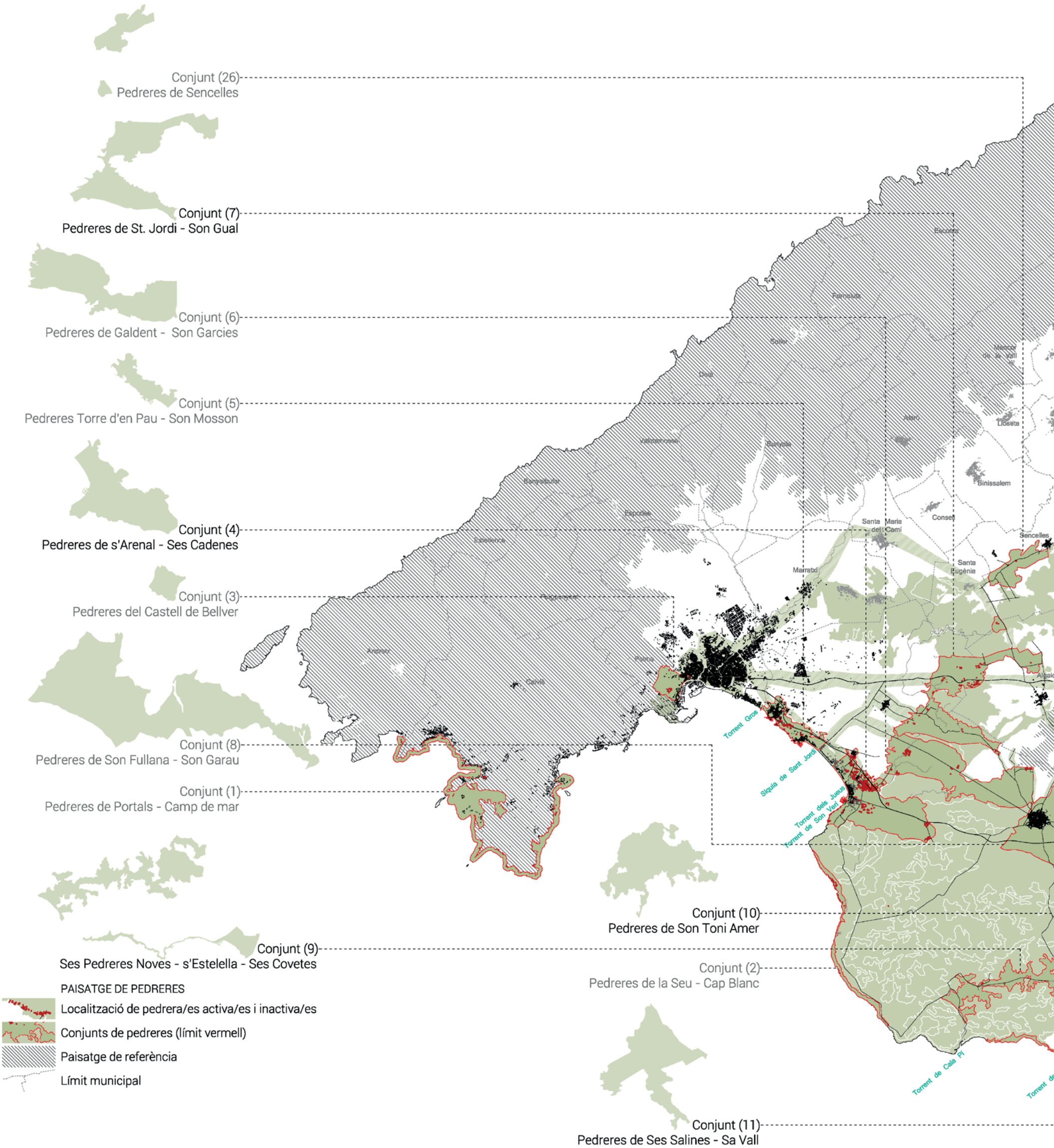
TOYO ITO - KAZUJO SEJIMA, DOM-INO Z 1982

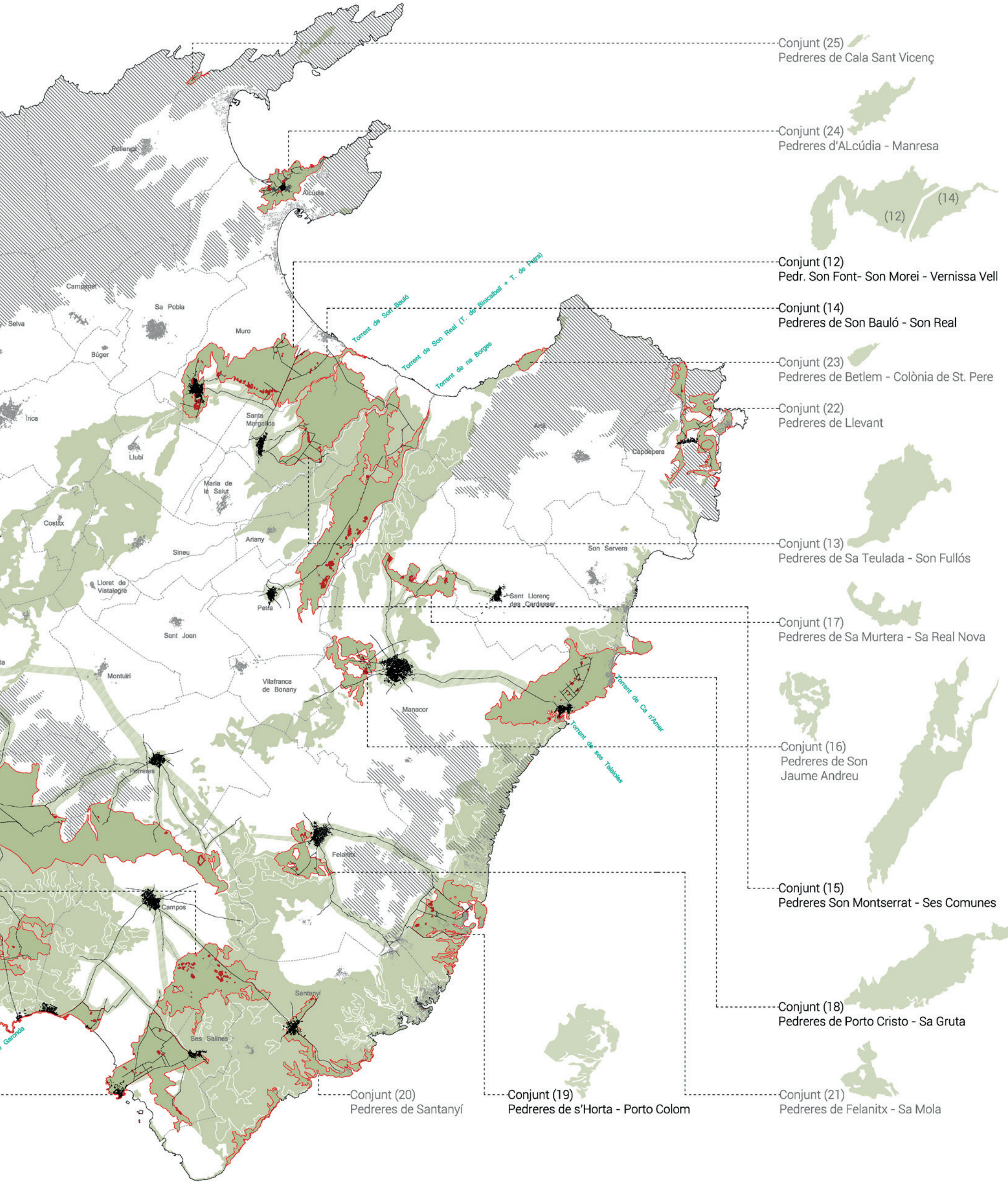
This document features an image or representation of the interior environment that captures the materiality, the influx of natural light, and the appropriation of the space. The choice of technique is flexible; it may include a render, a photograph of a model, or a collage.

calendar

week 01	17-18 february	#2 site plan #1 atlas model
week 02	24-25 february	table talk
week 03	03-04 march	#3 inhabit plan sharing
week 04	10-11 march	table talk
week 05	17-18 march	#4 thermodynamics
week 06	**24-25 march**	**mid term**
week 07	31 march - 01 april	#5 human vs urban scale
week 08	07-08 april	Mallorca study trip
week 09	14-15 april	table talk
	21-22 april	easter break
week 10	**28-29 april**	**mid term**
week 11	05-06 may	table talk
week 12	12-13 may	table talk
week 13	19-20 may	*charrette*
week 14	**26-27 may**	**final review**

mallorca study trip




Conjunt (25)
Pedreres de Cala Sant Vicenç
Conjunt (24)
Pedreres d'ALcúdia - Manresa
(12)
(14)
Conjunt (12)
Pedr. Son Font- Son Morei - Vernissa Vell
Conjunt (14)
Pedreres de Son Bauló - Son Real
Conjunt (23)
Pedreres de Betlem - Colònia de St. Pere
Conjunt (22)
Pedreres de Llevant
Conjunt (13)
Pedreres de Sa Teulada - Son Fullós
Conjunt (17)
Pedreres de Sa Murtera - Sa Real Nova
Conjunt (16)
Pedreres de Son Jaume Andreu
Conjunt (15)
Pedreres Son Montserrat - Ses Comunes
Conjunt (18)
Pedreres de Porto Cristo - Sa Gruta
Conjunt (20)
Pedreres de Santanyí
Conjunt (19)
Pedreres de s'Horta - Porto Colom
Conjunt (21)
Pedreres de Felanitx - Sa Mola
Pollença
Alcúdia
Campanet
Sa Pobla
Selva
Muro
Búger
Inca
Santa Margalida
Llubí
Maria de la Salut
Costitx
Ariany
Sineu
Lloret de Vistalegre
Petra
Sant Joan
Montuïri
Vilafranca de Bonany
Manacor
Sant Llorenç des Cardassar
Son Servera
Artà
Capdepera
Porreres
Felanitx
Campos
Santanyí
Ses Salines
Torrent de Son Bauló
Torrent de Son Real (T. de Binicalbell + T. de Petra)
Torrent de na Borges
Torrent de Ca n'Amer
Torrent de ses Talaioles

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