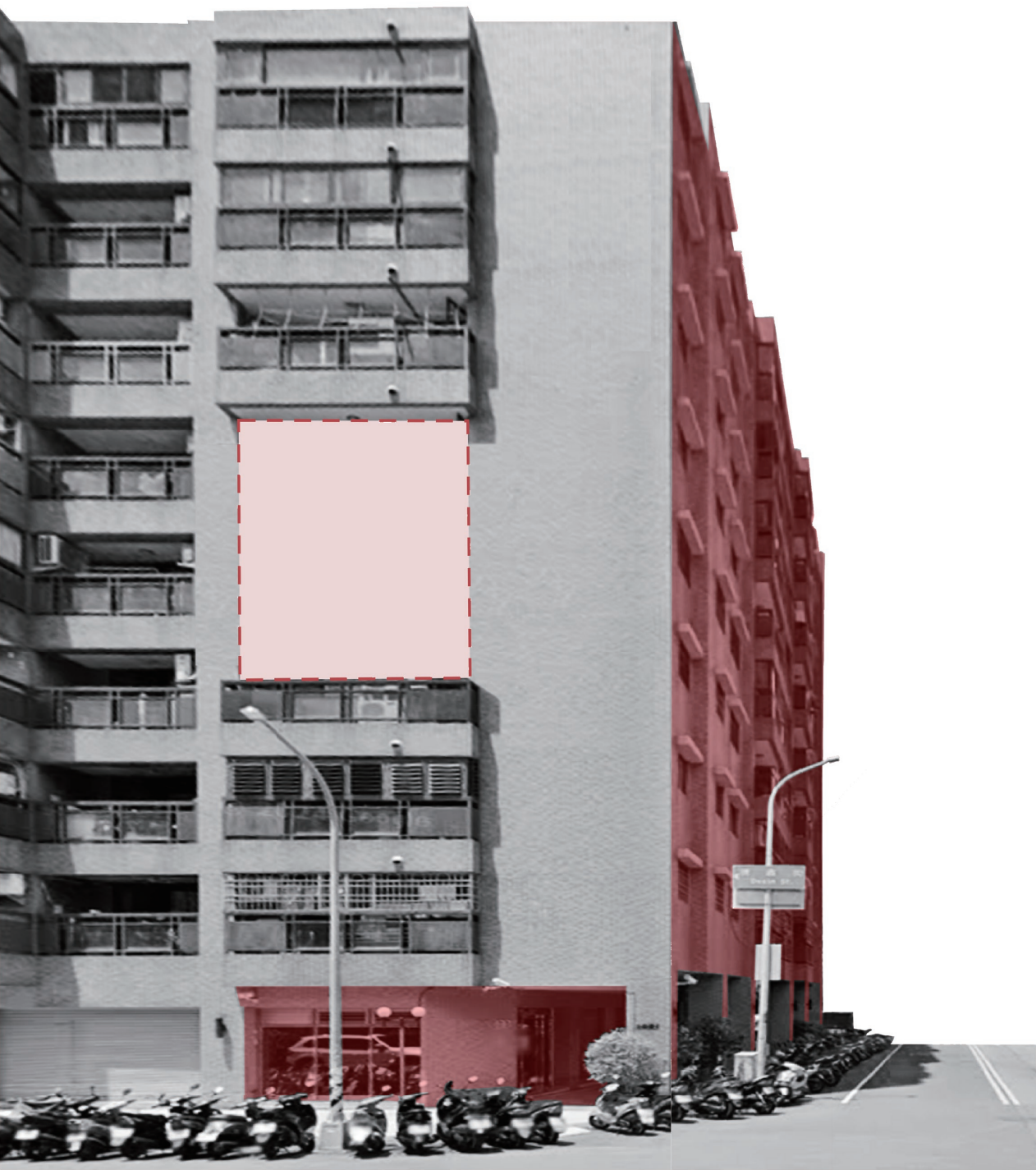


# TAIWAN RENEWAL HANDBOOK

TSUNG-HAN OU



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# PERSONAL & STUDIO INFORMATION

**Name:** Tsung-Han Ou

**Student number:** 5942942

**Name of studio:** Architectural Engineering

**Design tutor:** Mo Smit

**Research tutor:** Eric van den Ham

## Argumentations of choice of the studio:

My personal interest and belief in architecture as a practical discipline lies in how the creative freedom of architectural design could be explored and, equally importantly, executed through careful consideration of building details, and that the role of building details is not merely to solve problems emerging from the architectural design process, but rather is an engaged part of the design itself, and actively influences the quality of spaces. The strong technical focus of aE studio would enable me to pursue and deepen the understanding of my fascination.

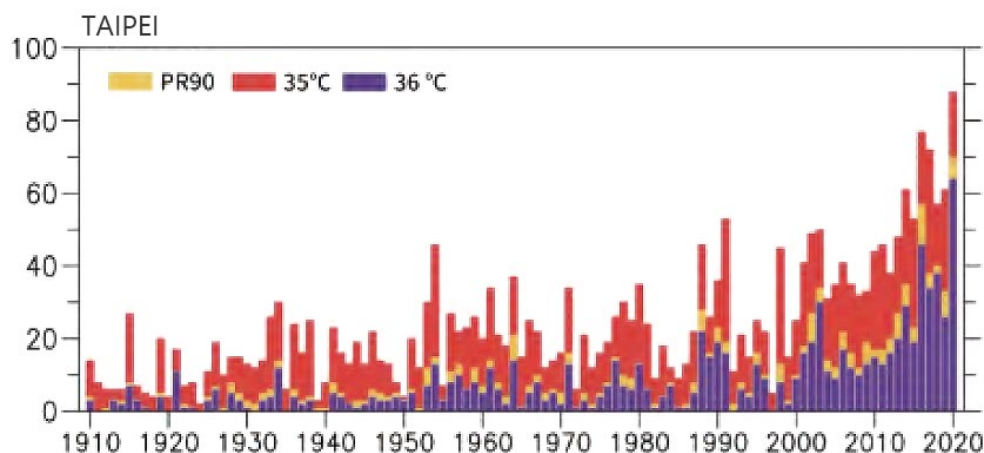
# GRADUATION PROJECT INFORMATION

**Project Title:** The Taiwan Renewal Handbook

**Keywords:** Critical Regionalism  
Tropicality  
Low-tech solutions  
Bioclimatic Design  
Adaptive reuse  
Passive design

## Problem Statement:

Sustainability is the prevalent agenda for architecture. The topic is doubly relevant in tropical Asia, where increasingly high heat in the summer has become a pressing issue for urban areas of the region. Taiwan, located right on the Northern Tropic in east Asia, is also facing such challenge. Major cities such as Taichung and Taipei are especially subjected to frequent extreme heat over the course of past decade (TCCIP, 2024, p16).



*Graph of the number of days in extreme temperature over the years in Taipei City (Central Weather Administration (Taiwan))*

Under such stress, the demand for a more sustainable built environment becomes all the more obvious. The effect of a sustainable building comes in two parts: With the wide adoption of more optimally (and passively)-climatized building spaces, the need for air conditioning and consequently its heat emission could be lowered, directly alleviating the urban temperature (TCCIP, 2024, p44), both in short and long term.

Officially, the actions are being taken through the form of EEWB Green Building Evaluation System since 1999, and recently the Taiwan 2050 Net-zero Emission Policy plus its conjunctive legislation efforts. Based on the EEWB System, the architectural sector of the policy suggests that all of the new buildings & 85% of the existing buildings must be built or renovated to become “Nearly-Zero Energy Buildings”, whose annual energy consumption per square meter of floor area should be less than 100kWh/(m<sup>2</sup>.yr) (Wang, 2024).

The EEWB System has been an important foundation for the facilitating sustainable architectural practices, and is comprehensive in nature, covering site biodiversity, building envelope’s thermal performance, and building equipment efficiency, with a bias towards the latter (Wang et al., 2023). However, among the rating criteria, one important building aspect that is the maintenance and component lifespan has not been considered.

So, while the EEWB System offers directions in adopting new building solutions and equipment for the designers, it can’t effectively change the way buildings as physical environment are being conceived in our culture, where buildings are treated as simplistic, static shelters rather than an active system where its interactions with the climate and the users throughout the building’s lifespan are carefully considered by both the designers and users; As such, buildings in Taiwan are often repaired only when part of it fails, either physically or programmatically. This phenomenon is evident in the common practice of retroactive building additions that are all so ubiquitous within Taiwanese cities. The criteria by which the green building policies were implemented in the architecture sector appears to only be built upon this negative general attitude rather than devised to remedy it. (Hu, 2010, p30-48)

Considering the circumstances, what methods can the task of sustainable architecture be carried out by while addressing this unique practical issue?





1895~1945  
The modern building materials and tectonics were established around this period.  
(Lin, 2006, p4.1-5.57)



1999~  
Introduction of  
Building Information



# PAST



# PRES

1970s~  
The phenomenon of misdesigned/  
mismanaged buildings started to  
become prevalent.



*Visualization of the problem statement*



# TAIWAN 2050

2021~  
Introduction of Taiwan 2050  
Net-zero Emission Policy.

Introduction of EEWB Green  
Evaluation System.

# SENT

# FUTURE



# ?

How do we build  
sustainably,  
while responding  
to this  
phenomenon?

## Overall design question & objectives:

**How can we develop architectural solutions for the adaptive reuse of an old apartment building that are easy to implement and maintain within the opportunities & constraints of Taiwan's architectural context?**

The design project would come in two parts:

1. General design: The search, experiment, and categorizing of existing and/or new technical building solutions that emphasizes the simplicity of execution on a practical level.
2. Integrated design: The application of said building solutions onto an adaptive reuse design for an old Taiwanese apartment building.

The project as a whole would be an experiment/exercise on the methods a building could be transformed to reach a higher level of sustainability and user comfort.

## Technical interest:

For starters, I wish to focus on the research and development of passive, low-tech solutions that can be retrofitted to existing buildings. The focus will be on three aspects:

1. The material/detailing's resistance against the hot and humid subtropical weather of Taiwan.
2. Components and schemes that combine into passive solutions, enhancing the climatization quality of the building spaces.
3. The component/scheme should be easy to manufacture, install, and maintain.

On a practical level, by lowering the technical threshold for the implementation and upkeep of the building hardware, these "general solutions" could be more readily-adoptable by the common architectural practitioners and users. Meanwhile, the approachability the solutions would be an experiment on how the design can communicate and negotiate with the persisting circumstances of how the buildings are typically being perceived and managed.

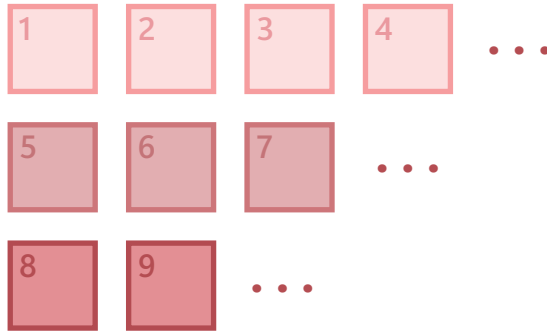


## CLIMATIC CHALLENGES



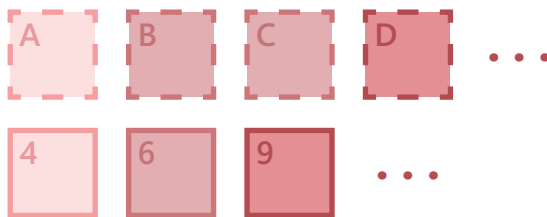
- + Comfort
- + Material durability

## 1. EXISTING SOLUTIONS



- Materials
- Detailing/connections
- Spatial schemes

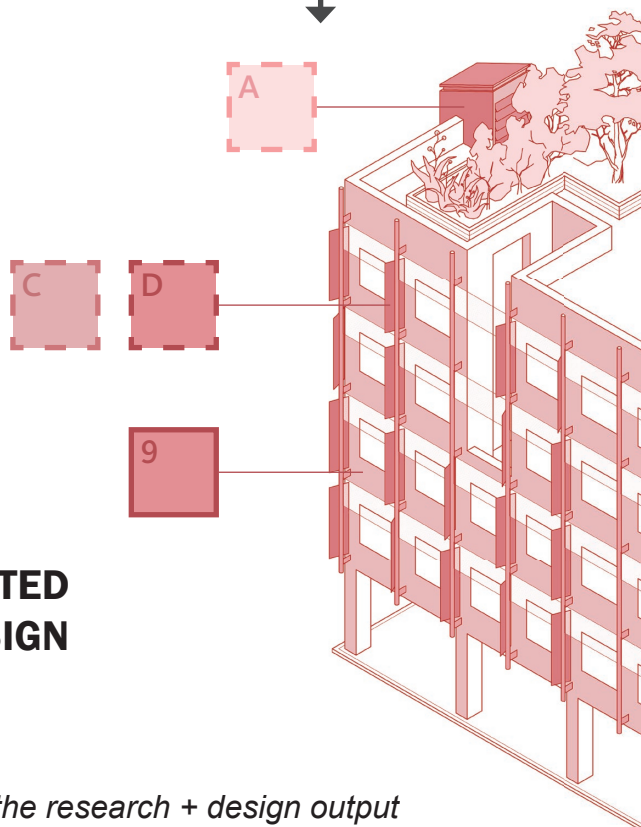
## 2. GENERAL DESIGN



- + Regional material logistics
- + Low-tech emphasis

- New solutions
- Compatible existing solutions

## 3. INTEGRATED DESIGN



- + Site context
- + Sun/wind orientation

- Application of General Design onto adaptive reuse of an old apartment building

## Context:

While the general design will address to the general context of Taiwan, the integrated design will be an adaptive reuse of an old apartment building in Taipei City, Taiwan, which should feature a site and target building that lack unique physical or cultural properties, and thus the design would be an exemplar project on how the new building solutions could be applied to other generic apartment (or even other types of) building project, as the design plans of most apartment buildings are highly standardized.

Between the research and the two design phases, climate will be the primary determinant throughout the whole project. The climate zone of Taiwan falls between humid subtropical climate and tropical wet & dry climate (H. E. Beck et al, 2020), where it sees around 27°~30°C in the summer and 15°~20°C in the winter in the cities (Central Weather Administration (Taiwan), 2021). What is noteworthy is the extreme weather conditions, with frequent peak temperature exceeding 35°C, heavy rainfall and high wind speed during typhoon encounters (Central Weather Administration (Taiwan), 2023). The building elements here should adapt to the high heat and humidity, and also account for the extremes.



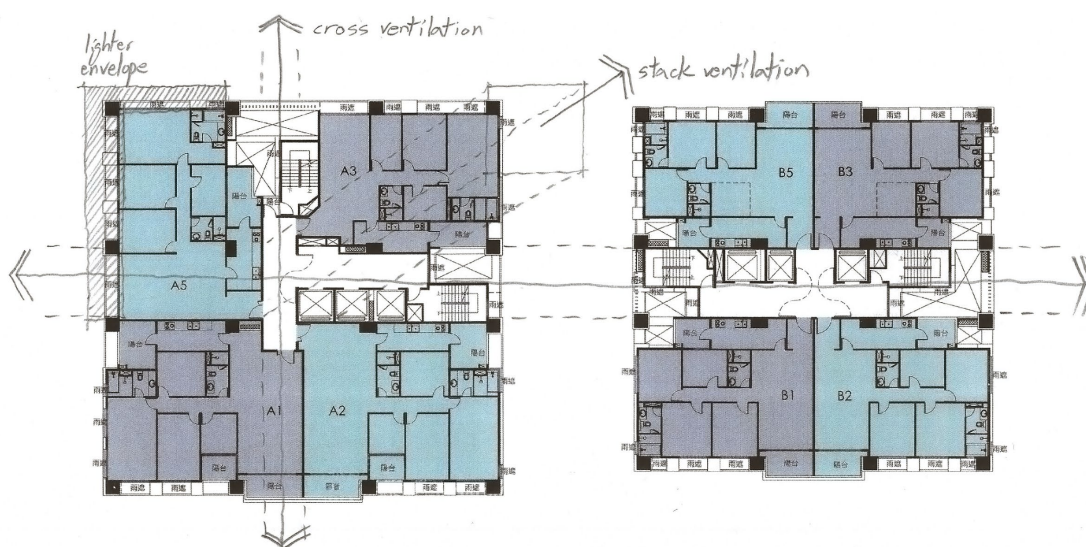
*A typical street view featuring apartment buildings of different ages in Taichung City, Taiwan (Photo own)*

## Programme:

Adaptive reuse of apartment building is chosen as the subject of the integrated design due to its prevalence in Taiwan's urban fabric. Over 50% of residential buildings in Taiwan are multi-story apartment buildings (Architecture and Building Research Institute (Taiwan), 2022), and roughly 23% of them are less than 20 years old, whose structures are designed and built by the modern seismic-resistance standard (Ministry of the Interior (Taiwan), 2020) (Hu, 2023), and thus can have their lifespan safely and reasonably expanded through renovation as they age. This type of building would be the main subject my research and general design aims to be applied to, especially for the buildings on the older end of this group.

The project will retain the residential use, including the programming of the house, while keep the diminishing of home units as the result of the renovation to minimum. Additionally, following the premise of the research, which is to create an opening for newer building solutions to be adopted on a great scale, the project will explore the possibility where the original inhabitants can remain in the building, or relocated on a very short term, during the renovation process, so as to minimize the logistical friction of the project on a practical level.

The major goal of the reuse design is to facilitate user comfort in moderate and extreme heat, where the former would largely revolve around passive design schemes, and the latter calls for minimizing the use of necessary air conditioning. The increase in comfort level would naturally lower any additional energy consumption. Meanwhile, to keep the scope of the project focused on climatic design, innovation in the social aspect of housing programmes will not be the main objective but nonetheless welcomed and may potentially emerge during the design process.



*Intervention sketch on the floorplan of a typical apartment housing project in Taiwan*  
(正隆官邸, 正隆(股)公司, sketch by author)

## Research questions & objectives:

**What are the climatic/cultural/practical challenges Taiwan's architectural sector faces, and how can they be addressed through building solutions?**

The main research question would be divided into several sub-questions, following the research direction. The plan is to first identify the existing climatic challenges and their respective architectural solutions.

- 1. What climatic challenges do the architectures in Taiwan face?*
- 2. What/how pre-existing architectural features & details address the relevant climate challenges?*

Once uncovering and categorizing the tried-and-tested solutions for (sub)tropical regions, the second step is to find out how they may stand within the unique and uncertain conditions of Taiwan. The cultural/practical context should be studied and analyzed, and parameters should be established for the evaluation of the ensuing design process.

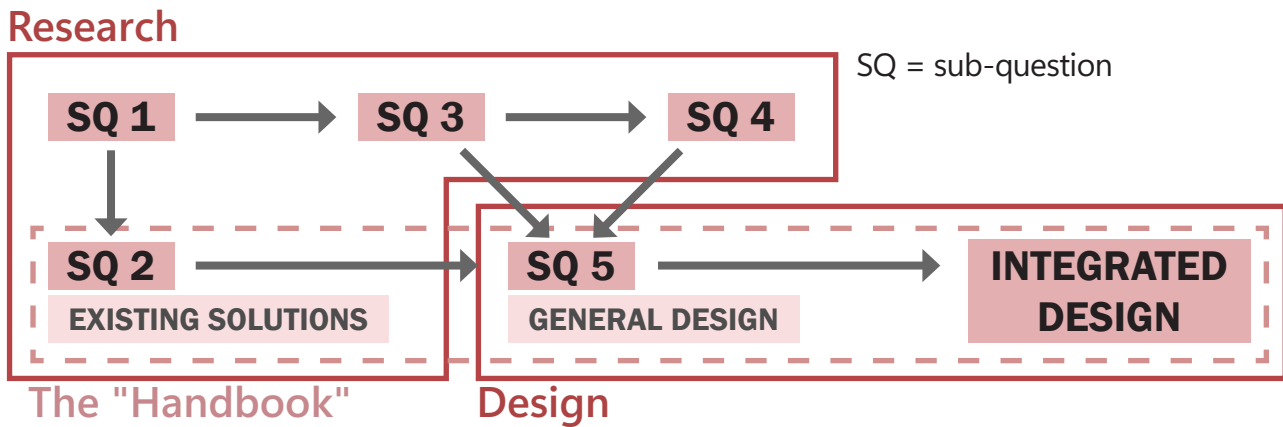
- 3. What are the practical challenges of the architectural sector in Taiwan? What are the phenomena/tendencies of how buildings are (mis)designed and (mis)managed that need to be addressed?*
- 4. How could the form, spatial quality, and user interaction of the new architectural solutions communicate and negotiate with Taiwan's architectural culture and identity?*

The fifth sub-question will be the initiation of the general design phase, utilizing the findings from the climatic and cultural research.

- 5. How may these architectural features & details be made to adapt to Taiwan's context? (And what part of Taiwan's status should be improved?)*



## Relation of research & design output:



## Research & design hypothesis:

Numerous studies have already concluded that bioclimatic design is indeed an effective practice to massively lower the energy consumptions of building (as a result of increased comfort level) in various climate conditions (Y. Elaouzy et al., 2023, p2), so it should serve as a reasonable framework for my research and design, which seeks to produce appropriate bioclimatic design solutions for Taiwan's unique conditions. A contextualized hypothesis for this project therefore would come in two parts:

1. By emphasizing on low-tech and passive design, a collection of sustainable building solutions can be produced that fits the criteria of easy manufacturing, implementation, and maintenance.
2. By lowering the requirement for maintenance, the building solutions can be the first step in mitigating the tendency of building mismanagement once integrated into a building.

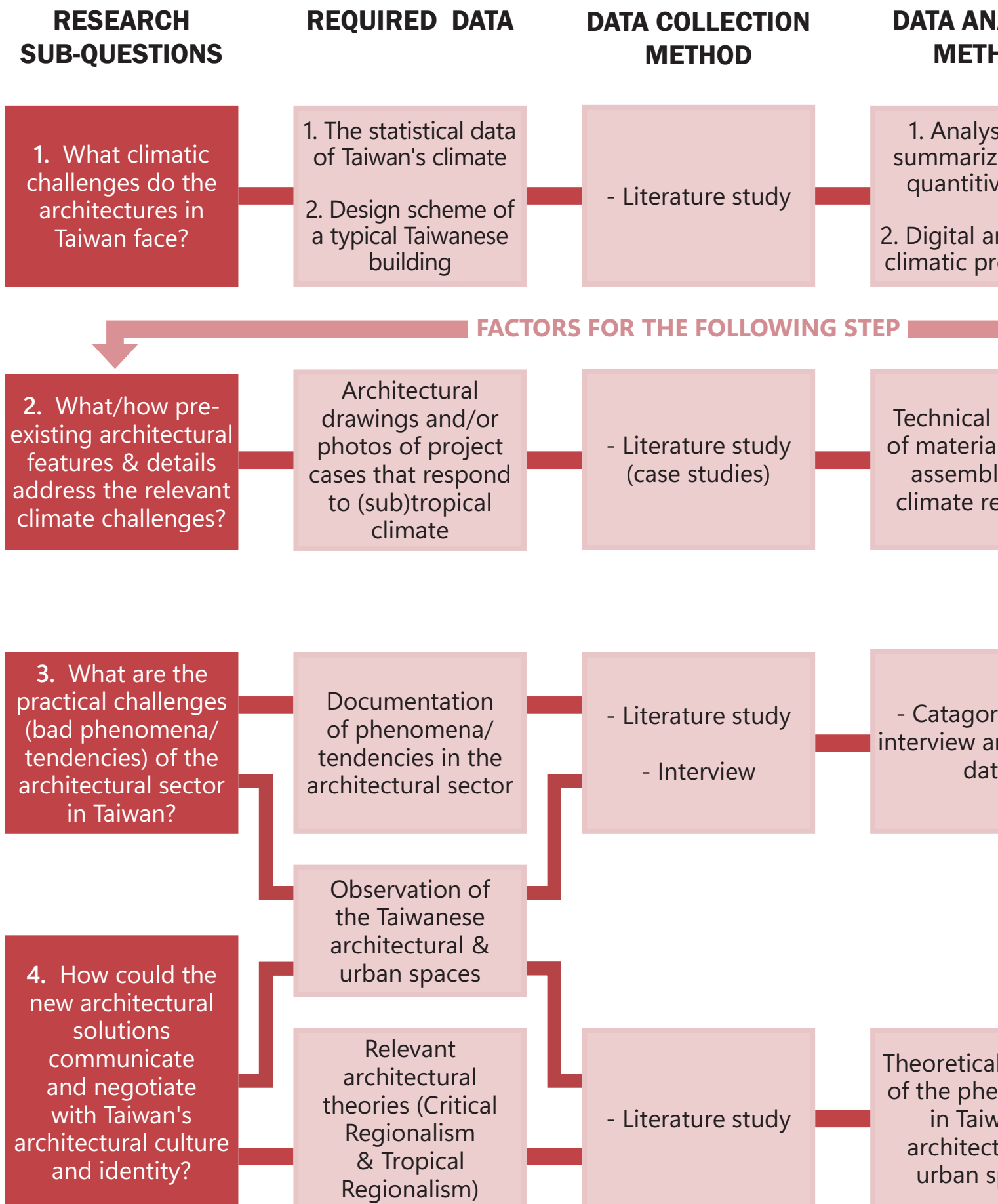
The first part is effectively the main principles for the design of my project and will be proactively approached in the design process; As for the second part, while it inevitably comes with a level uncertainty, a critical evaluation will still be made based on the outcome of the cultural analyses.

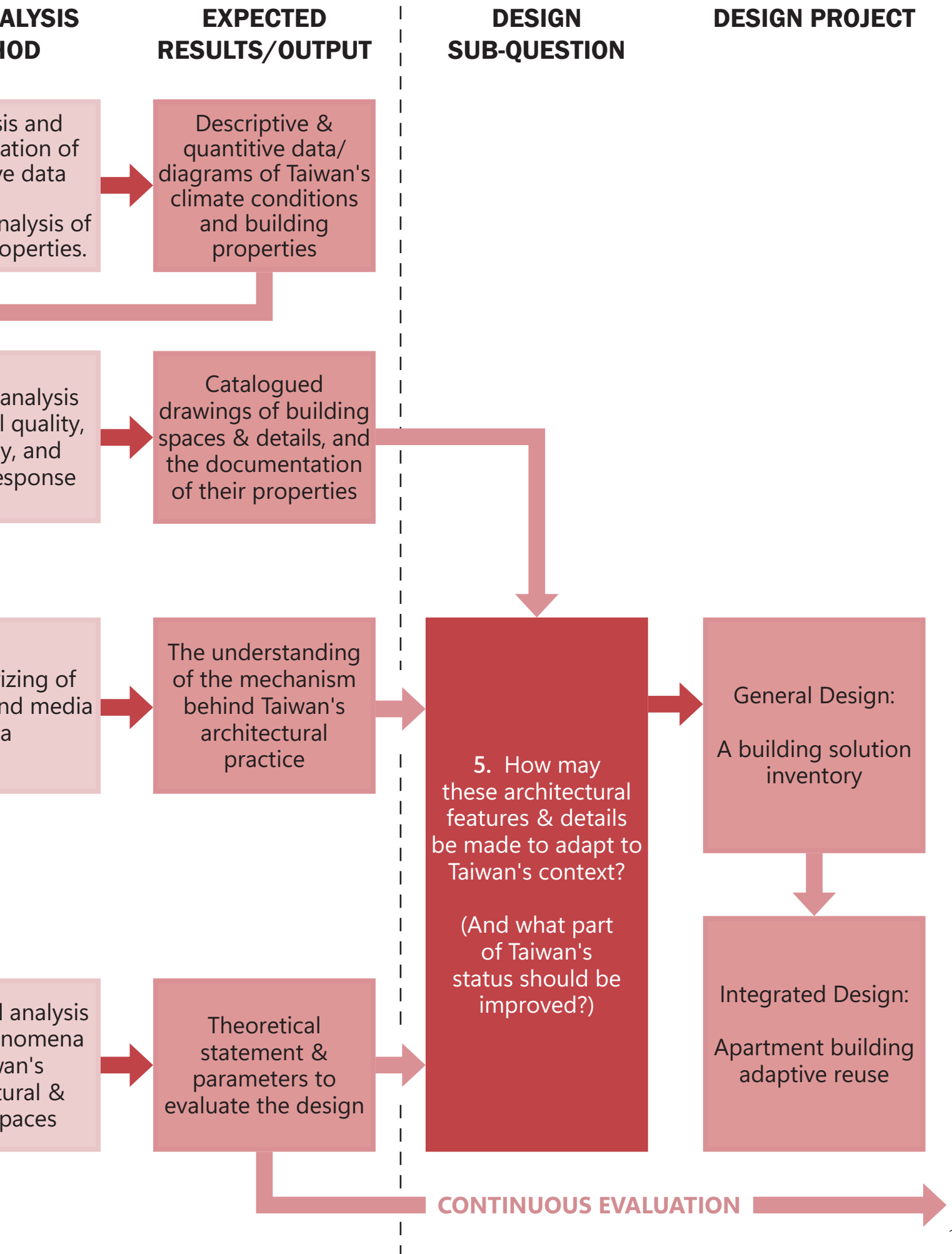
## Antithesis:

1. As the typical apartment building scheme is highly standardized and efficient (albeit not flexible) (T.N. Hu, 2010, p30-48), there might be potential incompatibility with the retrofitting approach of the general design.
2. The general design may have limited impact on the negative tendency of architectural practice in Taiwan.



## Thematic research + design methodology:





## **Applied theories:**

### **1. Bioclimatic Design (V. Olgyay et al.)**

The climatic research and case studies will be based off the premise of Bioclimatic Design, which directly links architectural solutions to the human comfort factors under local climate conditions. On top of the general theory, digital environmental analysis tools such as Climate Consultant and Ladybug Tools in Grasshopper will be utilized throughout the research and design process.

### **2. Critical Regionalism (K. Frampton) / Tropical Regionalism (A. Tzonis et al.)**

Critical Regionalism can be described as a general concept for architecture/architectural solutions that are inspired by the climatic and cultural environment they're situated in, and therefore are intertwined with the broader culture of the region.

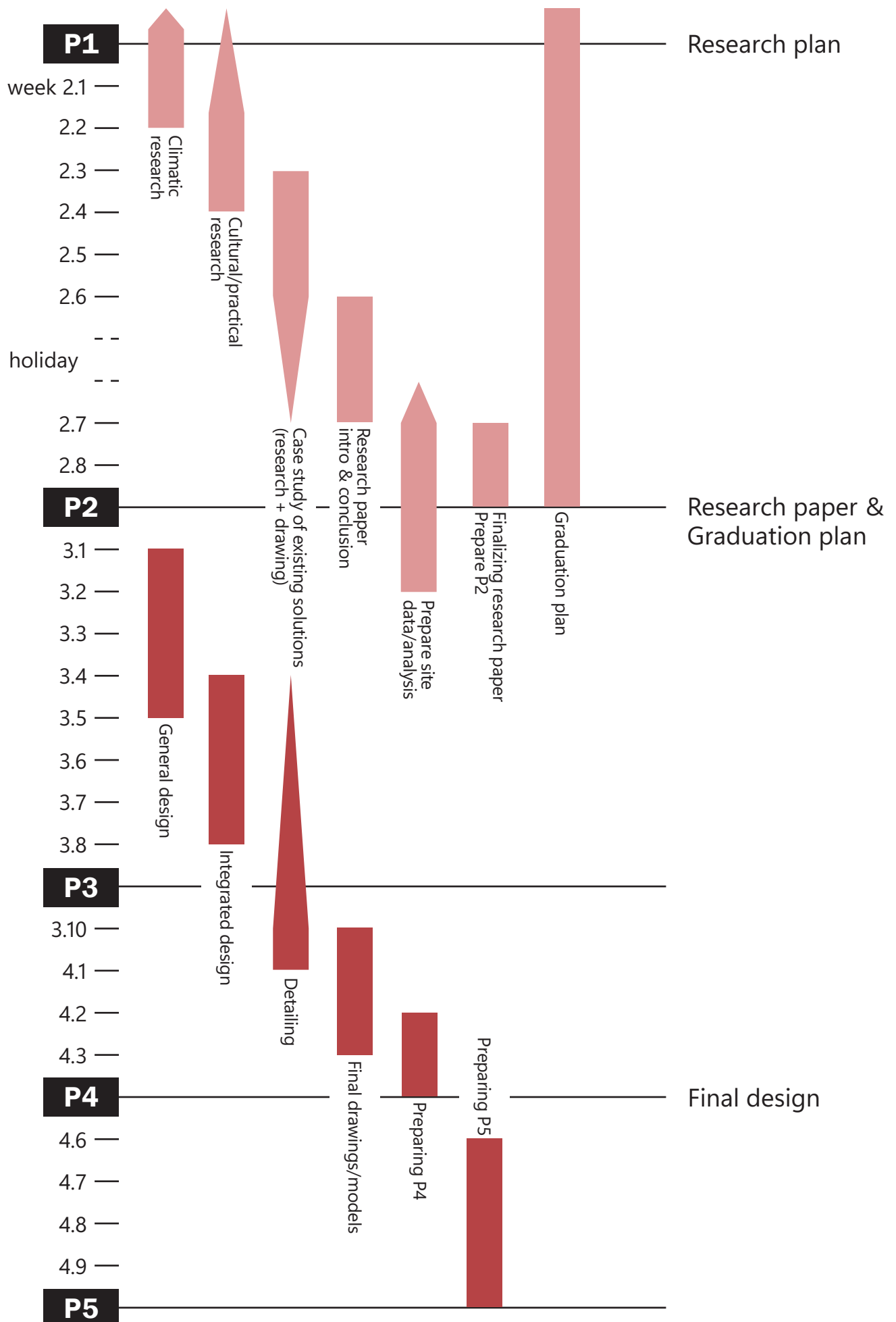
Tropical Regionalism is built upon Frampton's theory but focuses specifically on tropical/subtropical areas. It identifies the intense climate conditions as the driving force for architectural cultures in these regions, and provides perspectives on how technical solutions to the climate could be actively related to the cultural functions of the architectural design.

## **Relevance:**

The nucleus of the design/research topic is the response to Taiwan's climate for sustainable building solutions, addressing mainly the challenges of hot & humid weather, and hence the research will be applicable to other tropical and subtropical zones around the globe, especially southeast Asia where its practical circumstances have resemblance to those in Taiwan.

While the scope of the final design output is limited to one specific residential programme and building typology, it should be seen as exemplar project for the application of the general design, whose focus on low-tech solutions is meant to fill the 'gap' between the current state of the local architectural praxis, and the (hopefully) eventual condition where the Taiwanese architecture sector as a whole is capable of developing a more advanced technical know-how in the coming decades. It seeks to inspire future, more advanced solutions while raising awareness of what part of Taiwan's built environment status quo needs to be challenged and improved upon.

## Yearly research & design schedule:



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