

REIMAGINE

Sustainable Alpine Architecture & Tourism:
Reimagining through Circular Strategies

RESEARCH PLAN
Architectural Engineering
Graduation Studio

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Research tutor:

Argumentation of choice of the studio:

The approach in the graduation studio of Architectural Engineering from a technical point of view appealed to me a lot, which is why I chose the studio in the first place. Also, the studio was recommended to me by students who were following it at the time. The research, design projects and good stories from alumni pointed out to me that there was a lot of freedom in shaping your graduation project, which made me enthusiastic. I did not have a clear idea of what I wanted to work on yet, but I hoped that by choosing this studio I could find the research and design topics that would be worth spending my graduation year on. The technique behind architecture and its technical solutions, strategies and innovations have always fascinated me. I normally want to know what is behind the engineering part and the choice for certain technical solutions, so the idea of having plenty of time to explore that in the Architectural Engineering studio just seemed like a perfect fit for me.



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KEYWORDS

Circular Building Strategies, Sustainable Tourism, Climate Change, Alps, Austria, Circularity Gap, Material Loops

INTRODUCTION/GENERAL PROBLEM STATEMENT

Since the 18th century, the Alps have served as a laboratory for various fields of study, such as natural sciences, cultures, and architecture. Constructing structures in the mountains was an impressive accomplishment in the past, given the lack of modern building technologies and accessibility to the region. Once a Laboratory of Modernism, this research plan is written with the aim to explore in what way the Alps can be a laboratory for circular building methods and contribute to closing the material loops.

Challenges in Alpine Region: Climate & Tourism

Climate change is expected to significantly alter landscapes, ecosystems, and human activities in several ways, potentially rendering some current practices or environments unsustainable or unfeasible in the future if we do not act upon it. In the Alpine region, temperatures are increasing at a concerning pace, nearly twice as fast as in other parts of the northern hemisphere. This shift is affecting previously untouched areas, and with unsustainable land use and tourism, the already fragile Alpine biodiversity faces further strain. Ensuring a stable climate and ecological integrity is crucial to maintaining a high quality of life for everyone in the Alps and promoting a sustainable regional economy.

“With less than ten years to 2030, taking ambitious action to address these challenges is more imperative and crucial than ever to limit irreversible damage to the climate and the natural richness in the Alps.” Alpine Convention in their Multi-Annual Work Programme 2023-2030.

“Goal: The Alps shall be a model region for a sustainable future worth living in for humans and all other species in 2030 and beyond.”
The Alpine Convention, 2022

The challenges in Alpine Regions revolve around climate change, which changes landscapes and has a significant impact on the quality of the Alps and the balance between humans and nature. It is because of this richness in quality, like nature, well-being, winter and summer sports, that a lot of people come to the Alps. Tourism is a major contributor to the economy of these regions. However, climate change is putting this source of income now at risk. Trying to maintain and stabilise this economy, there are already a lot of strategies for sustainable tourism, but the current unsustainable forms of tourism only amplify the negative impact of climate change and its effects on the landscape. The main assets of the Alps are the beautiful landscapes and the diverse natural and cultural heritage. To protect this heritage, it is necessary to adopt a balanced approach based on sustainable tourism.

A lot is changing, due to the challenges of climate change. Still, one thing will most probably remain: In the Alpine regions, people will continue to enjoy tourism and winter sports in the future, striving for health, freedom and unique experiences. This will only be possible in the future in harmony with society and the environment. Therefore, tourism must be developed with low sustainability risks and chances to bring back the qualities of the Alps.

Challenges in Alpine Region: Circularity Rate

It is not just tourism that is unsustainable, the transport and building sectors also have a significant impact on climate change and are major greenhouse gas emitters. Then there is also the misperception and idealization of Alpine landscapes as untouched natural environments, obscuring the reality of extensive urbanization and its associated issues. Despite the rapid urbanization of the Alps, driven and intensified by tourism and recreational activities like skiing, there is a lack of comprehensive studies addressing the challenges and proposing strategies for sustainable development.

While many strategies to make buildings more sustainable focus on energy efficiency and passive techniques, they often still neglect material circularity or reuse. Austria's circularity rate in 2022 was only 13.8%, indicating significant room for improvement. Despite successes in some areas, Austria is still at the start of the journey like most countries and still has a long way to go. Achieving a climate-neutral circular economy requires comprehensive changes, including technological and economic changes, as well as changes in the attitudes and behaviours of the entire society, which necessitates a significant paradigm shift. Despite this challenge, Austria aims to become 100% circular by 2050, which means it must accelerate its progress even further over the next 26 years. The next steps will be to preserve and extend the lifetimes of what is already made - especially in the built environment - and to start closing material loops.

OVERALL DESIGN OBJECTIVE

As stated before, building in Alpine Regions used to feel like an accomplishment and on top of that the Alps served once as a Laboratory of Modernism. As a starting point, the objective for the future could be phrased as one in which the Alps are seen now as a Laboratory for Circular Building Methods, while contributing to closing material loops in these regions is the real accomplishment.

With this as a base for the design objective, a bold vision could be created: "A circular building project in the context of the Austrian Alps, contributing to a more sustainable way of tourism and fulfilling the circularity ambitions."

In the scheme of challenges (Fig. 1), the room for improvement in the circular economy, more sustainable ways of tourism and preserving and restoring the quality of the Alps, are the topics in which sustainable architecture could play a key role. Themes that could be addressed regarding the programme are making the circular innovation visible and letting people, inhabitants and tourists, enjoy the quality of the Alps.

Currently, the stated design objective aligns with the bold vision. The question that arises is how to fulfil these visions and desired futures. The attainable solutions will hopefully be found through thematic and design research.

The overall objective of this project is to develop and use a design approach that prioritizes circularity. By integrating principles like material reuse (if possible) and innovative design strategies, the project aims to make use of a strategy for environmentally conscious architectural interventions adapted to the challenges and opportunities of the alpine context. Intending to inspire human-nature coexistence and emphasize the qualities of the Alps, so that people do not just survive their alpine surroundings but live and thrive in them.

OVERALL DESIGN QUESTION / DESIGN HYPOTHESIS

How to design a **circular building project** in the Austrian Alps that not only contributes to **sustainable tourism**, but also to **closing the Circularity Gap in Austria**?

Thematic focus point:

How can the design serve as a **manifestation of circular innovation**?

Programmatic:

How can the design restore **the qualities of the mountains**, emphasize them and let people (inhabitants & tourists) **continue to enjoy** them?

THEMATIC RESEARCH OBJECTIVE

Objective: **Develop/find effective design solutions and/or strategies** to help bridge the Circularity Gap of Austria while aligning with sustainability goals for tourism in the Austrian Alps.

The main objective of the thematic research is to investigate the potential of certain circular design strategies for architecture and building practices in the Austrian Alps. Within the thematic research, it is interesting to investigate material reuse as a circular building practice and see what the potentials are in this context. It should be considered whether reusing materials carries the greatest potential to contribute to closing the Circularity Gap in Austria, or whether other circular strategies are more adequate.

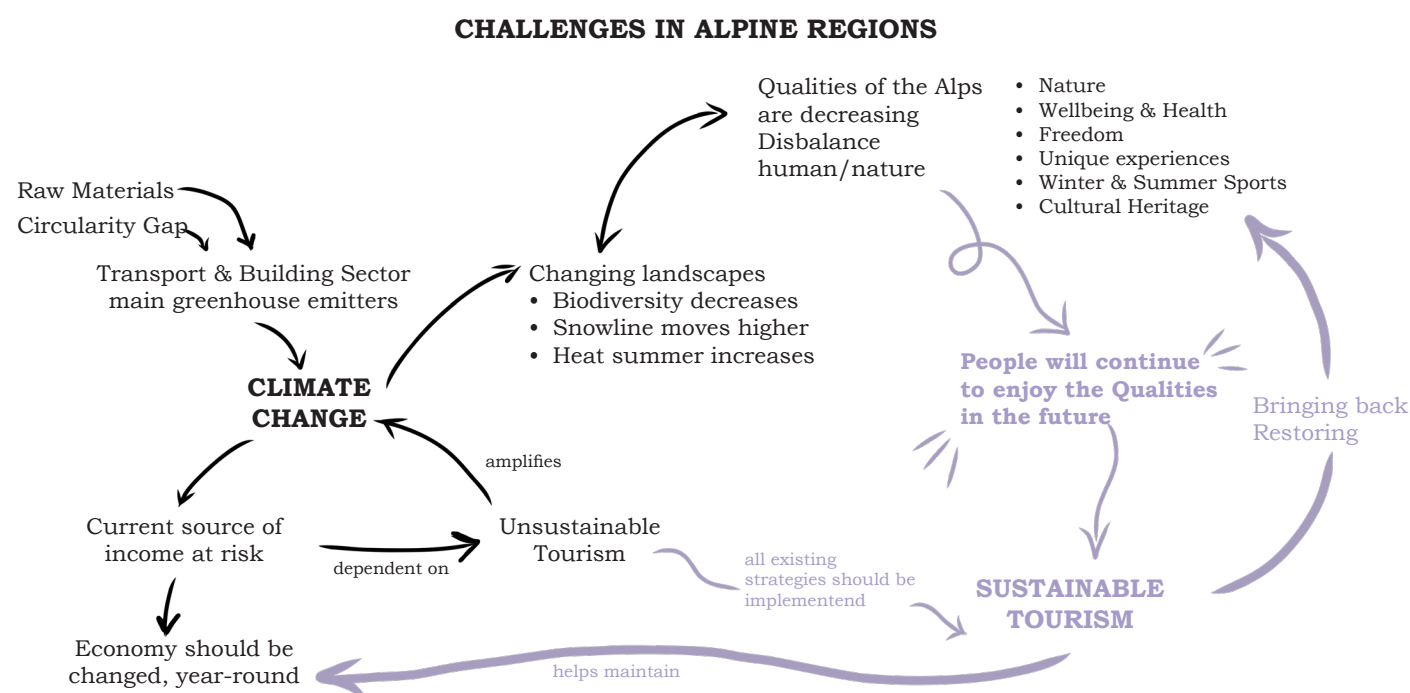


Fig. 1: Challenges in Alpine Regions and their relations

In addition, it would be useful to find out, how this can be integrated into the design process. The aim is also to gain knowledge about precedents of circular projects and the integration of technology in the design process, in this way having guidelines in making choices concerning materials, building methods and construction.

The research should also give insights into the various flows in the tourism sector that are currently taking place in an unsustainable way and where there is the greatest opportunity for improvement. This should provide knowledge and insight into how to contribute to increasing the sustainability of tourism flows, so that informed choices can be made, especially in the programme and the needs of users.

This themes of the research directly align with the general problem statement of the ambitious circular ambitions of Austria and the desired change into sustainable tourism strategies to maintain the economy. By researching how to effectively contribute to these ambitions and how to add value with architectural interventions, the research theme aligns with the overall design objective, aiming to design a circular building project contributing to a more sustainable way of tourism.

THEMATIC RESEARCH QUESTION(S) / RESEARCH HYPOTHESIS

Question: *How can circular solutions be **effectively integrated** into the design process of reimagining Architecture in the Austrian Alps to enhance **the Sustainability of Tourism** and contribute to **closing the Circularity Gap in Austria**?*

Sub-questions:

Which (combination of) circular solutions contribute to **closing the Circularity Gap in Austria**?

Researching the Circular Economy of Austria and hopefully finding out what potentials there are and which suit the design objective best. Should there be a focus on reuse strategies with reclaimed materials or will for example biobased material solutions be more of use?

Which (material) flows should be prioritized to enhance **the Sustainability of Alpine Tourism**?

By answering this question, insights can be gained into the flows that are present within Alpine Tourism. Which ones have a significant impact on the sustainability of tourism and how could this sector be even more improved in their sustainable strategies?

How can the **integration of circular solutions be optimized** within the design process?

This sub-question relates to the first one and to the ‘effectively integrated’ part of the thematic research question. When answers to the first sub-question are found, it would be useful to find out how they could be integrated optimally into the design process of the project in this specific context and its challenges.

THEMATIC RESEARCH METHODOLOGY

The thematic research will employ a combination of qualitative and quantitative methods, including literature review, case study analysis, and maybe a form of prototyping and eventually organising the potential of circular strategies. These methods will provide a comprehensive understanding of the challenges and opportunities related to which circular strategies have exciting potential and how to implement them. The method of research per sub-question is described in Fig. 2. Next to that the expected answers and knowledge that will be gained with the research are estimated. To conclude the methodology scheme with the desired outcomes to use as design input.

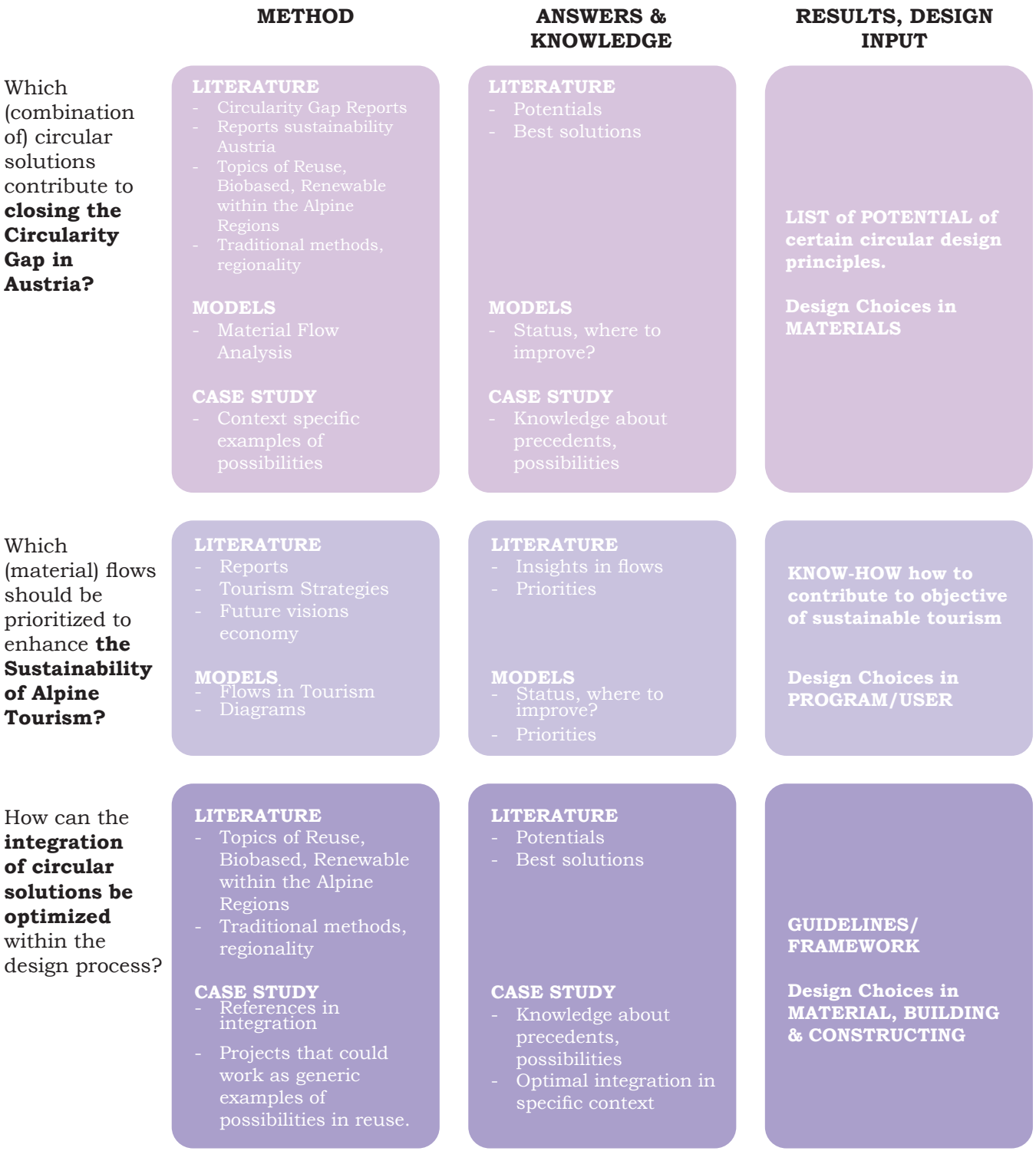


Fig. 2: Thematic Research Diagram, Method and Outcomes per sub-question.

EXPECTED RESULTS / DESIGN IMPLEMENTATION

The thematic research endeavours to drive tangible outcomes and deliverables aimed at facilitating sustainable change in the Austrian Alps. Success will be measured using key performance indicators that assess the effectiveness of circular design principles in closing the Circularity Gap in Austria while improving the sustainability of tourism. These assess the efficiency of material use and reduction of materials and resources. Eventually, the long-term sustainability should also be evident and the research and design implementation should fulfil the needs.

As mentioned, the expected outcomes of the thematic research per sub-question are visible in Fig. 2. The outcomes contain (a list of) the potential of certain circular design principles to effectively contribute to closing the Circularity Gap in Austria. On top of that, the research should help form guidelines for integrating circular design principles into the project and possibly a framework assessing how to implement the strategies efficiently. This will make sure informed choices can be made about materials, building methods and construction in the design process. The research anticipates uncovering the environmental and social impacts of architectural interventions in sustainable tourism. These insights will be essential in shaping the overall design approach, steering the development of innovative and resilient architectural solutions tailored to the specific needs of the Alpine region and its inhabitants and ‘users’.

Through a synthesis of knowledge and insights gained from the thematic research, the design project could aspire to realize its vision of fostering a more sustainable future for tourism in the Alpine regions, while serving as a blueprint for circular building practices in the Austrian Alps.

REFLECTION ON RELEVANCE

Given Austria’s ambitious goals for the circular economy in both 2030 and 2050, there is an urgent need to accelerate the implementation of circular solutions to address pressing environmental challenges. In the context of climate change-induced vulnerabilities, the development of sustainable architectural practices takes on heightened importance, particularly within the tourism sector, which constitutes a base of the regional economy. By advancing the understanding of circular building methods and their potential applications in the Austrian Alps, the research attempts to preserve the economic resilience of these regions while fostering environmental awareness.

The thematic research contributes valuable insights to both societal and scientific domains by addressing the critical need for sustainable building practices in Alpine regions. Not only does the research address the critical need for sustainable building practices in Alpine regions but it also holds the potential to inform future architectural projects using circular strategies. It also aims to make a meaningful contribution to the broader discourse on climate change mitigation and adaptation. It attempts to bridge the circularity gap within the sensitive environments of the Austrian Alps, where the balance between human activity and natural ecosystems is increasingly precarious.

In the end, the insights obtained from this research hold broader implications for the field of architecture, maybe with possible extension beyond the confines of Alpine regions. By addressing the pressing need for circular architectural solutions, the project seeks to inform and inspire future endeavours in architectural design and construction. Architects, engineers and ‘users’ of the context (inhabitants and tourists) stand to benefit from the findings, which have the potential to eventually shift towards more environmentally conscious practices.

LITERATURE

Ad Hoc Working Group for the Preparation of the Multi-Annual Work Programme (MAP) 2023–2030. (2022). MULTI-ANNUAL WORK PROGRAMME OF THE ALPINE CONFERENCE 2023–2030. In *The Alpine Convention*. Retrieved April 1, 2024, from https://www.alpconv.org/fileadmin/user_upload/Organisation/AC/XVII/AC_MAP_2023-2030_en_web.pdf

CGR Global 2024. (2024). <https://www.circularity-gap.world/2024>. Retrieved March 16, 2024, from <https://www.circularity-gap.world/2024>

Circle Economy & ARA. (2019). CGR Austria. In <https://www.circularity-gap.world>. Retrieved March 15, 2024, from <https://www.circularity-gap.world/cgr-austria>

De Rossi, A. (2006). *Modern alpine architecture in Piedmont and Valle D’Aosta*. Allemandi.

Kissling, T. (2021). *Solid, fluid, bionic: changing alpine landscapes*. Lars Müller Publishers.

Pia, F. (2018). *Urbanizing the Alps: Densification Strategies for Mountain Villages*. Birkhäuser.

The Alpine Convention. (2019). Climate-neutral and Climate-resilient Alps 2050 Declaration of Innsbruck. In <https://www.alpconv.org/>. Alpine Convention. Retrieved April 1, 2024, from https://www.alpconv.org/fileadmin/user_upload/Convention/EN/Declaration_Innsbruck_EN.pdf