

Sustainable tourism form in villages

Develop a building typology linking tourists and local residents making use of locally harvested bio-based building materials

Personal Information

Qianyi Wang 5100585

Faculty of Architecture & the Built Environment, Delft University of Technology Julianalaan 134, 2628BL

Design tutor :Mo Smit Research tutor :Tanya Tsui

Argumentations of choice of the Architectural Engineering studio:

My curiosity for making processes made me choose this studio. The focus of my undergraduate study is mainly the aesthetic aspect of architecture, therefore in the final year project, I would like to dig deeper into the pragmatical aspect of architecture. From the introduction and previous works of students, I can see the concern of aE studio for urgent questions in the world and the willingness of solving these questions through architectural interventions. That's also what I would like to achieve in this academic year.

Keywords: building material harvest, sustainable tourism, industry residue reuse, vernacular architecture, architectural identity, synergy

Definitions:

Sustainable tourism: According to World Tourism Organization(2008), sustainable tourism is a form of tourism that promotes the concern for economic, social, and environmental issues, as well as calls for attention to improving the tourist experience and addressing the needs of the local community. It is a concept toward Sustainable Development Goals which is included in the United Nations Resolution called the 2030 Agenda.

Rural tourism: A tourism activity that occurs in non-urban(rural) areas, providing visitors with experiences related to nature, agriculture, and rural lifestyles. These rural areas usually have low population density and agriculture or forestry-dominated landscape and land use, as well as traditional social structures and lifestyles(World Tourism Organization, 2020).

Bio-based material: Conventional bio-based materials are made from plants materials such as wood. Conventional bio-based materials are biodegradable while modern bio-based materials are not all biodegradable. The latter is extracted or produced from living organisms, which have undergone more intensive processing. This paper will mainly focus on conventional bio-based material.

Synergy: Synergy is a concept that the outcome of two sectors combined becomes greater after cooperation or interaction than the sum of the individual contributions. In this research plan, the term refers to the cooperation of local existing industry and tourism.

Problem Statement

Context

Rural tourism has a great potential in stimulating local economic growth and social change. According to World Tourism Organization(2021), rural tourism is complementary to other economic activities and contributes to the GDP growth and employment opportunities increasing. However, the existing mode of tourism in many villages especially in developing countries is not sustainable and eco-friendly. There is a tradeoff between the economy and the environment in these villages. When these villages are discovered, local industries such as agriculture will be marginalized, and the needs of local communities will be ignored. Capital will step in to develop the villages in the most favorable way for tourism. Too many tourists will cause pressure on the local ecosystem.

Lishui is a city in southeastern China. It is located in a mountainous area in Zhejiang Province, with beautiful scenery and numerous traditional villages. The countryside in this area is also experiencing similar trade-offs.

Groups with lower incomes cannot afford the initial investment required when developing tourism, and the local traditional agriculture has a low added value, therefore they may choose to leave their hometowns and sell or rent their houses to developers for development.

Driven by short-term gain perspective, the community often chooses to get advantages from development without limitation and not take other stakeholders into consideration when empowered. The decisions made according to short-term gain perspective, therefore, be harmful to the sustainability of development which is an action taken in long-term perspective (Sutawa, 2012). Groups with lower incomes cannot afford the initial investment required when developing tourism, and the local traditional agriculture has a low added value, therefore they may choose to leave their hometowns and sell or rent their houses to developers.

Program and thematic focus

As stated by World Tourism Organization(2020), the sustainability of rural tourism can only be realized by adopting and implementing a comprehensive and inclusive planning strategy. This strategy requires multi-action and multi-stakeholder participation.

The sustainability of architecture in the area of rural tourism should be a vital aspect. As mentioned before, when the local community is totally empowered, they may give up their land for short-term gains, and the intervening real estate developers will build resort hotels with no response to local climate or vernacular architecture to accommodate more tourists. The choice of building materials is actually an unsustainable point to blame. Whether it is a self-built house or a developer's resort or hotel, the sustainability of materials is often not in their needs. To quickly build and reduce costs, many builders (including villagers and developers) will choose modern materials such as reinforced concrete and steel, while only imitating traditional vernacular houses in exterior decoration in order to attract tourists. Therefore, many villages in Lishui dedicated to the development of tourism are facing the problem of homogeneity in architecture.

However, local agricultural wastes or other locally obtained bio-based materials have the potential to connect to sustainable tourism when used as building materials, while this new vernacular architecture may turn the village into a healthy living environment. In many villages of Lishui, the rice industry is a very important industry as rice is the staple food of southern China. Though burning the straw after harvesting is abandoned by the government due to the pollution, farmers in remote districts still adopt this method to quickly consume the waste and plant late rice.

Objective

The intention of the graduation project is to discover the possibilities of using the waste of village-based agriculture and other local renewable materials as building materials to develop a valuable building typology and create a synergetic model. This synergy model emphasizes the mutual promotion of agriculture and tourism, and how will these two lead to more sustainable village development.

The graduation project consists of a research paper and an architectural proposal. The building typology is aiming at linking the local residents in the village and the tourists to then develop a sustainable and eco-friendly mode of tourism for the village.

The research paper will be divided into three parts. The first part is a basic study of the area, which is located in Lishui, west of Zhejiang Province, China. It will focus on the local traditional examples of rice straw as a building material and the reason why straw is gradually being abandoned.

In the second stage, I will choose modern projects that have been built in other areas and use rice straw as building materials to conduct the case study. Specific application of rice straw to building elements (e.g. roof, insulation, interior walls...), the specific construction methods adopted by architects in these cases will be classified and summarized.

In the third part, the application of rice straw (building components and construction method) in these cases will be evaluated according to the criteria of affordability, insulation performance, and durability developed by the authors through literature study and interviews.

Together with other research outcomes, the research paper that will be conducted before the design phase will provide a technical outcome. The outcome will then lead to the materials chosen, building methods adoption, and building typology development in the architectural proposal. The graduation project will be a response to the previous problem statement.

Overall design question

How to develop a sustainable form of tourism for the village in Zhejiang and establish a synergetic model to promote local agriculture and tourism through designing innovative vernacular architecture linking tourists and local residents which use bio-based material and agriculture waste as the main building material?

Thematic Research Question/Hypothesis

How could a local material strategy making use of local agricultural residues(rice straw) and local bio-based materials adopting low-tech building methods contribute to the affordability, durability, and thermal performance of the innovative vernacular architecture?

Or in the form of a hypothesis, the research paper will research:

If the innovative vernacular architecture aiming at linking tourists and local residents is designed using agriculture residue and local bio-based materials and adopting low-tech building methods, the quality of the housing will be improved in terms of affordability, durability and thermal performance.

Sub questions:

Considering the local climate, is the local agricultural residue (rice straw) suitable to use as local building materials?

As a building material, which building elements of the architecture are suitable to adopt straw?

What are the local bio-based building materials that are suitable for the village?

What are the possible low-tech construction methods of these building materials that can be adopted in this project?

How to evaluate these building materials from the perspectives of durability, affordability, and thermal performance?

State of the art

Bio-based materials are expanding rapidly due to their performance in environmental protection, sustainability, and efficiency when taking the issues of global warming, energy-saving, and life cycle analysis into consideration (Amziane & Collet, 2017). Like all materials, bio-based materials will probably encounter a series of environmental challenges that can affect the material performance. What's more, as they are organic in nature, bio-based materials appear to be more susceptible to damage by natural organisms than other materials, for example, the erosion of bacteria and fungus, or the attack of insects and other higher animals (Brischke & Jones, 2017). Therefore, there are now more researches towards the durability of conventional bio-based material and the emerging bio-based building material.

Within the emerging bio-based building material research area, bio-based concrete is a hotspot of current research. Bio-based concrete includes many different types, such as hemp concrete made from plant particles, or self-healing concrete that uses the metabolic activity of bacteria to repair cracks by adding a bio-based agent (Amazine & Arnaud, 2013; Tziviloglou et al, 2016).

For the conventional bio-based material, they are ideally for self-builders to develop their buildings due to the availability, inexpensiveness, and workability (Wanek & Kennedy, 2015). Although the materials are conventional, construction technology is constantly being updated. They are frequently combined with other modern materials to enhance durability. For example, in the construction process, combining conventional bio-based material together with prefabricated connection elements which are reusable are common solutions.

Research Gaps

Concerns about bio-based materials usually focus on durability issues. However, the author also expresses doubts about affordability. When the research site is in the rural areas of developing countries that are usually considered to have cheap labor, the construction period is not the focus of attention. The cost is considered to be more in the cost of the material itself (locally obtained and recyclable therefore cheap).

If these building materials need to be replaced regularly due to insufficient durability or require a lot of manpower input due to the long construction period, is there still an advantage in total cost compared with the existing building model?

Methodologies

In this research paper, a combined method including qualitative and quantitative research methods will be adopted. A diagram is created to link the methods and the research questions (see figure 1).

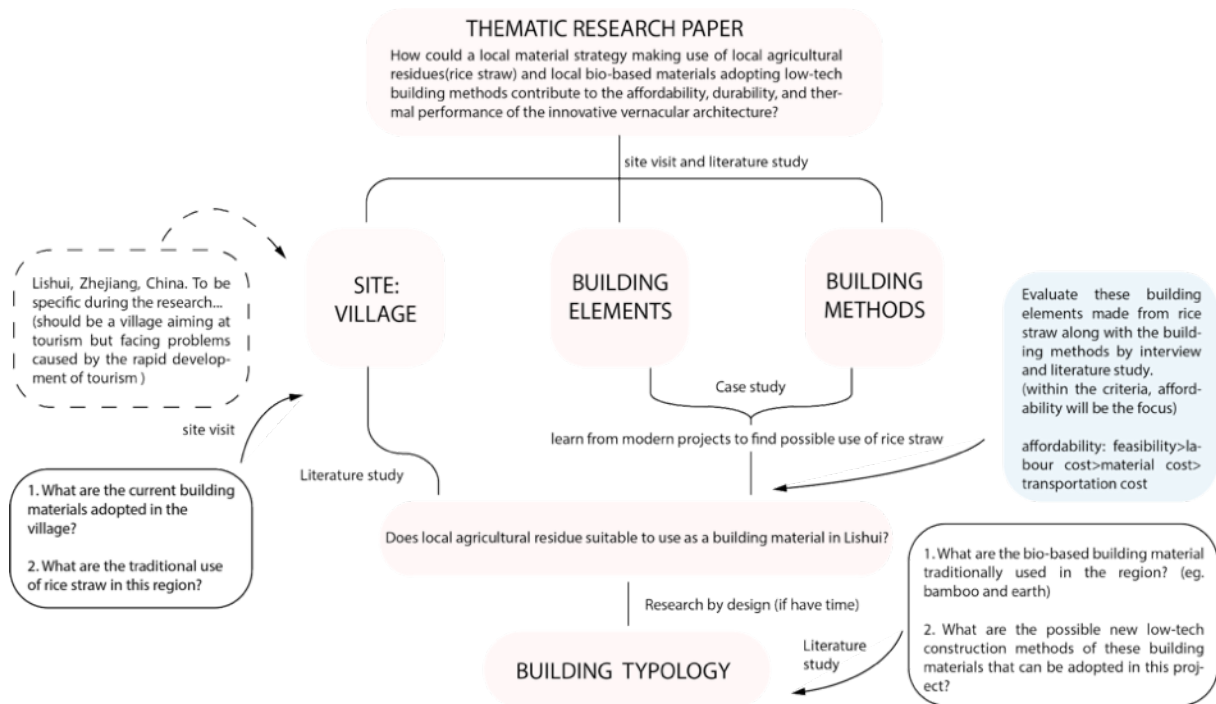


Figure 1: Diagram designed by author

The focus of the research paper would be the building element and construction methods identification and categorization of the cases adopting rice straws and the evaluation towards them.

During the evaluation phase, interviews with local architects, construction teams, and craftsmen will become a very important part. For each selected construction method and corresponding architectural elements, I will know the affordability and other characteristics of this method through the following questions:

1. Are you qualified for this construction method?
2. What is the estimated construction period and wages?
3. Do you think the construction method of rice straw and the corresponding architectural elements are suitable for the local climate?

Other metrics like durability and thermal performance will be evaluated through literature studies.

The outcomes of the research paper and the influence on design might be as follows:

1. The potential of residues of local agriculture used as building materials is proved, other local building materials will be identified and analyzed to provide a supplement. Local material strategy is able to help to develop a building typology for the sustainable development of tourism. The synergistic model will then be successful as the original industry can benefit the sustainable development of tourism for the village.

Relevance

This graduation project is aiming at a generic approach for village design. The possible solutions that will be raised in the research paper such as local material strategy could be applied to other villages aiming for sustainable tourism development all around the world. However, due to the limitations of the length of this research paper, the problems of tourism-dominated villages cannot all be covered and the research site should be specified. As a specific site will be chosen, the bio-based material types and building methods that will be analyzed in the research paper could not be directly adopted for other villages.

The ultimate goal of the research is to create a synergetic model for the villages through design. Villages that are eroded heavily by tourism are often losing their attraction because of homogenization. In the synergic model, the original industry will not lose from the development of tourism but will benefit from the sustainable development of tourism. The local community will not need to give way to real-estate developers and tourists but benefit from job opportunity growth and building condition improvement.

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