



# Cuicheng Project - Chengdemian Green Roof Ecological Plan

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**Abstract.** Green architecture has become the focus of the increasing global climate change. Under the current policy of reducing carbon emissions and the rapid development of the Chengdu-Demian Economic Belt, the green construction industry has shown a good development prospect, and the "Cuicheng Plan" was born. The plan addresses the problems of popular and personalised conflicts, such as the serious urban heat island effect and the lack of biodiversity protection. It is proposed to combine the design of the intelligent rain and flood management system for the accumulation and reuse of rain and flood to jointly create a new chapter of resource-saving, environmentally friendly, green, healthy and sustainable urban development, promote the improvement of the urban ecological environment in Chengdemian area, improve the ability of cities to resist climate change and build a good quality of urban green, healthy and sustainable development.

**Keywords:** Green roof plan, low-carbon development, environmental sustainability, building green buildings, project management

## 1 Introduction

### 1.1 Research Background and Significance

Global environmental problems have become increasingly serious in recent years, and problems such as climate change and resource depletion have emerged frequently. They have brought great challenges to the sustainable development of human society, and social development faces great challenges [1]. Under such a background, green architecture has received more attention as an environmentally friendly construction method. In the process of rapid urbanisation in Chengdemian, urban high-density areas face

problems such as insufficient development space, lack of ecological space, and significant urban heat island effect, which seriously affects the sustainable development of cities.

Roof greening is a project with roof greening as the main content [2]. It is an effective measure and major project to solve the contradiction between land pressure and ecological construction in urban high-density areas and alleviate the urban heat island effect. Therefore, the study aims to study the adaptability of different forms of green roofs in different environments and conditions and how to develop and design a variety of assembly forms of green roofs based on maximising their ecological and economic benefits through reasonable design and management, effectively alleviate the urban heat island effect, and promote the formation of The effective urban ecological network better helps to improve the urban ecological environment in Chengdeman area. Propose a theoretical strategy for harmonious coexistence between architecture and nature [3].

## **1.2 Data Sources and Research Methods**

The research first systematically sorts out the relevant research results at home and abroad, including academic journals, monographs and reports, through literature analysis, and adopts a research method combining qualitative and quantitative methods to conduct an in-depth exploration of the field of green roof innovation to provide theoretical background support for the research. Systematically sort out relevant research results at home and abroad, including academic journals, monographs, reports and others, to provide theoretical background support for this research. Secondly, the experimental research method will collect first-hand data and analyse the difficulties of green roof innovation. At the same time, in combination with the case study method, the typical cases are analysed in depth. This research will ensure that the results are comprehensive and accurate through various research methods.

## **1.3 Research Content and Structure**

The main content of this study is the response strategy of the green roof assembly ecological plan designed for cities under the current situation of insufficient ecological development space and significant urban heat island effects. The introduction will briefly introduce the background and significance, purpose and method, content and structure of this research. The second part will analyse the current situation of green roof difficulties, including the current situation and influencing factors of difficult plant selection and maintenance, as well as insufficient adaptability of the roof structure. The third part will discuss how to carry out the ecological design of green roofs and the current theoretical modelling. The fourth part will summarise the previous content and give corresponding suggestions and prospects. Finally, the reference section will list all the cited literature and typeset it according to the citation specification format.

## 2 Difficulties in Green Roof Ecological Construction

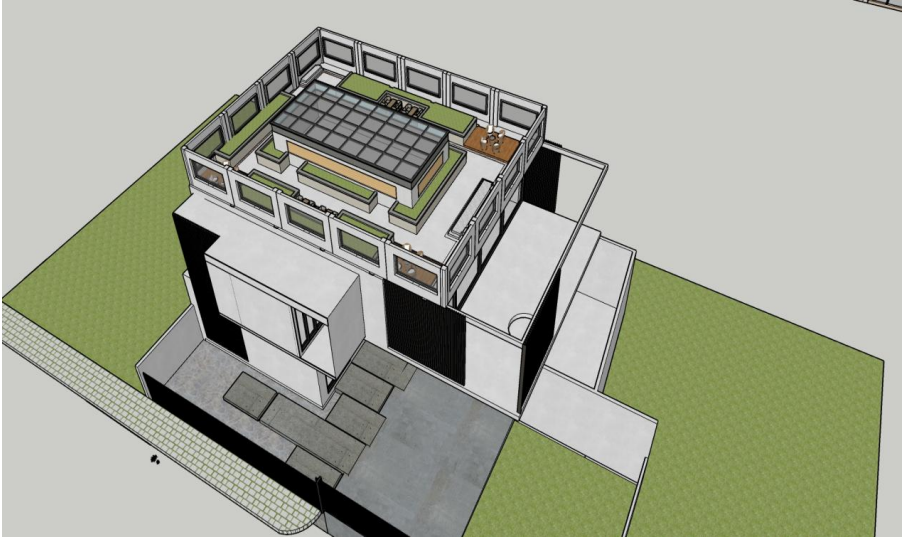
Due to the special roof environment, such as high temperature in summer, cold in winter, strong wind, and poor soil moisturising performance, higher requirements are put forward for plants' growth conditions. Therefore, when choosing plants, we should not only choose dwarf shrubs and herbs to facilitate load-bearing and roof transportation but also fully consider their drought resistance, cold resistance, wind resistance and other characteristics. When selecting, dwarf shrubs and herbs should be selected appropriately. In addition, the light intensity of the roof garden is large, and the plants should choose positive plants as much as possible [4]. However, in some specific small environments, in order to enrich the plant varieties, it is also necessary to choose semi-positive plants appropriately.

The design and construction of the roof structure often need to fully consider the needs of green roofing, resulting in problems such as roof leakage, water accumulation, and load-bearing exceeding the standard, as certain problems in waterproofing, drainage, load-bearing and other aspects. Therefore, in actual application addition, the planting layer of the roof is relatively thin in the design and construction process of the roof [5]. The soil has poor water storage performance, which easily causes short-term water accumulation and threatens plants' survival.

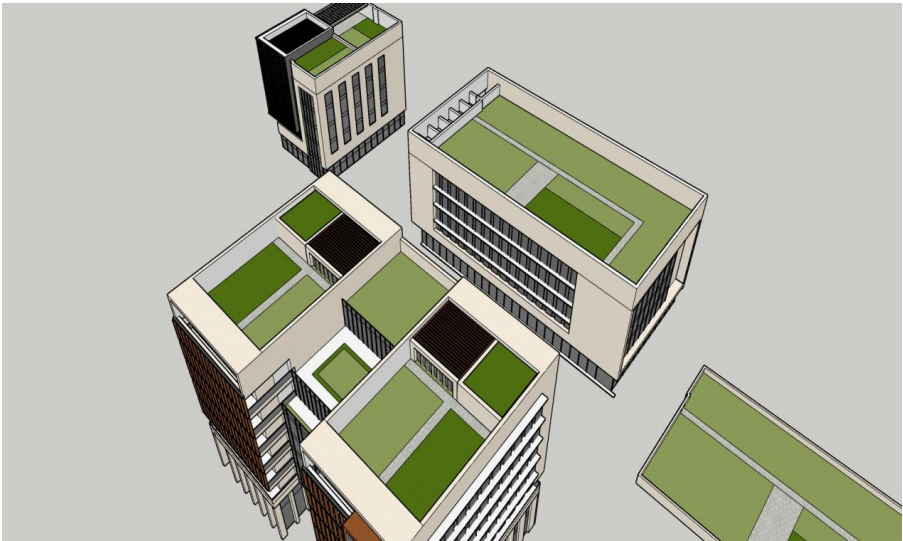
## 3 Strategies for Green Roof Ecological Development and Current Results

As presented in Figure 1, when choosing plant species, our team comprehensively considers the climatic conditions of Chengdemian, the carrying capacity of the roof, the convenience of maintenance and management, and the aesthetic effect [6]. Meanwhile, Figure 2 illustrates the preliminary rendering of a building complex implemented by the project, and the corresponding analysis shows that the ideal plant species in this project have the following characteristics:

- a. Drought tolerance: Such as rosaceae, it can reduce the need for irrigation.
- b. Shallow root system: It can not only play a protective role on the roof waterproof system but also meet the requirements of the waterproof system for plant growth.
- c. Wind resistance: The wind speed on the roof is usually high, and shrubs or plants with low wind damage on the ground can be alleviated.
- d. Diversified combination: Matching plants of different colours, shapes, and heights creates a rich sense of hierarchy and visual effects and enhances the green roof's ornamental value.
- e. Ecological community construction: It is conducive to improving biodiversity, enhancing the ecological function of green roofs, simulating natural ecosystems, and building stable plant communities. Depending on the area and use, such as roof rest areas and walking areas, choose suitable plant types and configuration methods to meet the needs of different uses.



**Fig. 1.** The preliminary rendering of a single building implemented by the project



**Fig. 2.** The preliminary rendering of a building complex implemented by the project

The project's roof is designed with a zinc roof, light steel check, thermal clay brick roof, and hot wall with vents, combined with traditional architectural technology and modern green architectural concepts. It is designed according to multiple factors, such as Chengdemian's climate. By integrating the above components, this kind of green roof can effectively adjust the indoor temperature in different seasons and reduce dependence on mechanical air conditioning and heating systems, thus saving energy consumption and reducing carbon emissions. Moreover, this design pays attention not only

to energy efficiency but also to ecological balance, as shown in Figure 3. It enhances the ecological functions of the roof, such as rainwater management and biodiversity protection, by planting plants and other means. Under many previous investigations in construction management disciplines, the design considering the application of lifecycle thinking [7, 8, 9], project management and modular construction technologies is beautiful and practical. While meeting the functional needs, the green roof system also pays attention to aesthetic design, highlighting the architectural appearance and enhancing the value of the building [10].

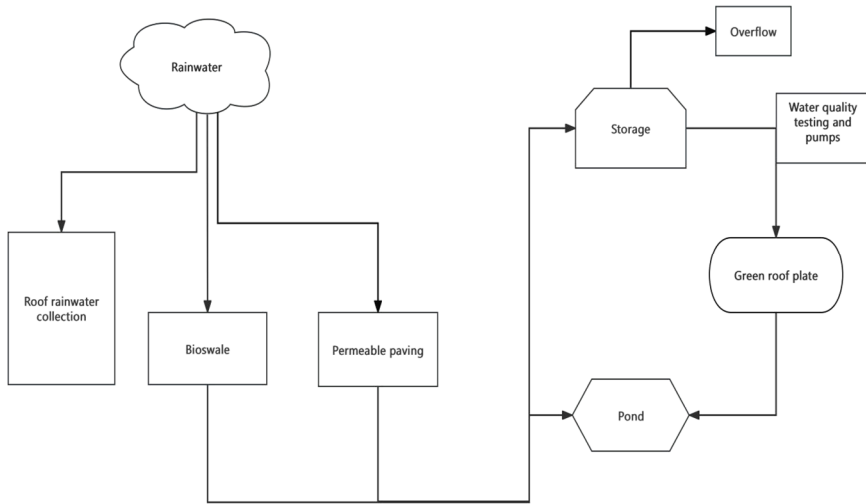


Fig. 3. Cuicheng green roof assembly design

## 4 Conclusions

Through in-depth research in the field of green building design and planning related to the previous literature, this paper uses the mixed research method to analyse and innovate the ecological construction of green roofs. However, in the face of serious challenges such as actual architectural planning positioning and high cost, the speed of promoting green roof assembly will be obvious. There are obstacles, but it is still an important greening project to solve problems such as insufficient development space, lack of ecological space, and significant urban heat island effect in the rapid urbanisation process in the Chengdeman area. Developing and designing various assembly forms of green roofs can effectively alleviate the urban heat island effect and promote the formation of an effective urban ecological network. This article advocates coordinating the relationship between urban development and green sustainable development based on maximising its ecological and economic benefits and providing feasible solutions to practical problems to promote improving the ecological environment of Chengdeman City.

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