

С. А. МАЛАХОВ
МАМО КАЛКИДАН АДДИСУ

ИСТОРИЧЕСКОЕ НАСЛЕДИЕ КАК КУЛЬТУРНЫЙ РЕСУРС. ИНТЕГРАЦИЯ НОВОГО ОБЪЕКТА В СТРУКТУРУ УНИКАЛЬНОГО АРХИТЕКТУРНОГО КОМПЛЕКСА В ГОРОДЕ LALIBELA, ЭФИОПИЯ. ТЕХНОЛОГИЧЕСКИЕ И ЭКОЛОГИЧЕСКИЕ АСПЕКТЫ

**HISTORICAL HERITAGE AS A CULTURAL RESOURCE.
 INTEGRATION OF THE NEW OBJECT INTO THE STRUCTURE
 OF A UNIQUE ARCHITECTURAL COMPLEX IN LALIBELA, ETHIOPIA.
 TECHNOLOGICAL AND ENVIRONMENTAL ASPECTS**

Исследование основано на материале эксперимента по реновации комплекса исторического наследия в городе Лалибела, Эфиопия. Уникальные свойства скальной архитектуры церквей, создаваемых в структуре скальных массивов, начиная с X и XI вв. дополняются специфическим характером народного строительства прилегающих поселений, использующих технологию глинобитных (земляных) конструкций. Важным обстоятельством проводимого эксперимента по исследованию комплекса и строительству отеля – объекта развивающейся туристической инфраструктуры является тщательное изучение традиционных технологий и экологических аспектов, включая климатические характеристики местности, источники энергообеспечения и взаимоотношения с местным сообществом.

Ключевые слова: уроки наследия, Лалибела, скальная архитектура, Арт-Отель, целостность среды, туристическая инфраструктура, экологические акценты эксперимента

The study is based on the material from an experiment on the renovation of a historical heritage complex in Lalibela, Ethiopia. The unique properties of rock architecture of churches created in the structure of rocky massifs, starting from the X and XI centuries, are supplemented by the specific character of folk construction of adjacent settlements, using the technology of earthen structures. An important factor in the ongoing experiment to study the complex and (also to) build a hotel, the object of a developing tourist infrastructure, is the careful study of traditional technologies and environmental aspects, including climatic characteristics of the area, sources of energy supply, and relationships with the local community.

Keywords: Heritage Lessons, Lalibela, Rock Architecture, Art Hotel, Environmental Integrity, Tourist Infrastructure, Environmental Emphasis of the Experiment

Introduction

Prerequisites for the study and experiment in Lalibela, Ethiopia. The problem of translating “lessons” of heritage into modern practice of environmental development; tasks of integrating valuable historical environment and modern objects

The objects of historical heritage around the world can be conventionally divided into unique and environmental. An entrenched rule that allows to give a special status to unique objects does not exclude the need to make decisions in favor of environmental integrity. The balance between the environment, unique objects and new constructions - single or complex - is one of the most pressing cultural, economic and organizational problems. The search for such a balance

can be attributed to the area of modern project methodology, the main goal of which is to create a sustainable and harmonious post-industrial environment.

Therefore, the construction of such a post-industrial environment is implemented on the basis of two counter programs: the first program is the study of positive experience of valuable historical environment and unique objects - all what we call “lessons of historical environment” and the second program is a certain planned level of new environment, the needs of which are determined based on the criteria of economy, cultural development, infrastructure and market. Thus, it is at the junction of these programs that the territory of the experiment appears, which resolves the potential conflict and establishes a balance between “new” and “old” [1].

The value (“lessons”) of historical heritage can be determined based on the following characteristics of individual objects and environments:

1. Uniqueness of artistic and stylistic characteristics of historical heritage objects;
 2. Cultural significance of unique and media objects for the place, country, the whole modern civilization.
 3. Contribution to the heritage of handicraft culture of individual monuments of architecture - examples of “expensive construction” (cathedrals, castles, ensembles).
- Effective traditional construction technologies and methods of “modest development” of the territory, inherent to the historical heritage. Use of available materials of natural origin: wood, stone, clay, earth, bamboo; economy and reproducibility of natural material.
4. The desire for “human scale” of the historical environment, largely adapted to the natural and urbanized landscape and due to the small step of constructive spans, the way of life of neighbors, the density of the historical environment, the limited size of homes and the modesty of investment.
 5. Sustainability of the environment based on self-sufficiency, self-governance and self-development of territories.
 6. Environmental balance and devotion of residents to their native place, social responsibility and cultural ritual.

As we can state, these characteristics testify to the unique and positive properties of the environment that preserves its continuity with traditional values, natural environment, “sense of place”, national sanctuaries, and construction methods. The program for the effective use of historical heritage, respectively, should be based on these characteristics.

Key problems of integration of historical environment and modern objects

The counter program, which is based on the needs of modern society, most often reflects the economic and social situation specific to a particular place and country. At the same time, it should be recognized that common aspects of most modern development programs are technocratic trends, market relations, new technologies, burdened with real problems. Such real problems include economic backwardness, social inequality, excessive selfishness of developers, environmental violations and disregard for cultural values. At the same time, the interests of tourist infrastructure increasingly come into conflict with the tasks of preserving historical values and the traditional way of life of the population in historical places. Technocratic models of the future are, most often, in contradictory relations with humanistic mod-

els of the environment. Appropriate intellectual, professional and political initiatives are required to resolve contradictions between “counter programs”.

The architectural process of participation in the dialogue between “old” and “new” is developing in several interesting directions. Interesting results of this process can be observed everywhere in different cities and regions of Europe, Asia and the African continent.

The material of the experiment in the Ethiopian city of Lalibela presented in the article addresses the following issues related to the discourse of dialogue of historical heritage and new infrastructural transformations:

A valuable historical monument - the historical Lalibela churches - is being researched.

The specifics of the traditional type of dwelling houses and neighborhoods are highlighted; emphasizes the “environmental specificity” of traditional Ethiopian settlements (“philosophy of human existence in natural space”).

Data are given on the features of geological factors that influenced the emergence of unique objects.

The task of cultural integration of heritage objects and new objects integrated for the benefit of tourism infrastructure and economy of the region is set.

The main results related to the effectiveness of the Rock Hewn Hotel experiment are defined. The results of the experiment demonstrate the contribution of the research and the project to the development of the theoretical aspects of the balance between historical heritage and innovation.

Experiment in Lalibela

Environmental philosophy of traditional architecture

Sites of historical heritage of Ethiopia have a strong, independent, living culture, reflecting environmental and climatic conditions, which, in turn, are tightly integrated into spiritual and religious beliefs dating back to ancestor worship, customs of social community, rituals and symbols. Due to the visible presence of traditional buildings in everyday life, many identical features and customary practices have been preserved in their original form.

The ecological philosophy, inherent to the heritage of Ethiopian traditional architecture, looks at humanistic conceptions of nature, the value and rights of nature; it explores how we should build relationships with nature and in nature, and the extent to which nature is or is not involved in our own human identity. Such a philosophical tradi-

tion also looks at whether nature and the environment are “useful concepts in general” or simply contribute to perceptions that predetermine our relationship with the world. The philosophy of the environment includes all the basic concepts of philosophy: metaphysics, our ideas about the basis and structure of things; epistemology, how we recognize and understand nature and how different methods of learning reveal different aspects of the natural world; its aesthetics, its specific language, ethics, the morality of our relationship with living beings and systems. In a broad sense, environmental studies also overlap with other disciplines, such as environmental psychology and environmental politics, and is furthermore cross-cultural, since different societies understand and relate to their natural environments in different ways.

For architectural practice, the link with the environmental worldview has always played a huge role. Man imitates nature in order to create his own environment, demonstrating in the form of their structures many structures that symbolize his understanding of natural and sacred principles. Analysis of forms, arrangements, symbols and figures of such structures usually leads to new ideas and typologies.

One of the typologies that emerged on the basis of structures ascending to nature are sacred buildings. All of creation evolves out of a sacred geometric pattern incorporated within the molecular seed structure. When these patterns associated with the seed structure are embedded in the architecture, there is an exchange of vibrations between the building and its inhabitants, just as a dialogue between man and nature leads to a sense of well-being.

Among the many historical holy places known in Ethiopia, one should first of all one should mention the church's erected inside the rocky hills. Rock churches in Lalibela, carved on the rugged mountain slopes below ground level, are ringed with deep voids and inner courtyards and connected to each other by a tangled labyrinth of tunnels and passages. The rock churches built during the Zagve(zagwe) Dynasty are the apotheosis of Ethiopian civilization. The emergence and collapse of great empires and dynasties in this country influenced the evolution and character of Ethiopian architecture [2, 3].

Object of historical heritage - Biet Ghiorgis complex in Lalibela

Contemporary Ethiopian culture was formed on the basis of the values and traditions of a powerful and religious ancient civilization with a rich cultural heritage. According to legend, Emperor Menelik, son of King Solomon and Queen of She-

ba, brought the “Ark of the Covenant” from Jerusalem to Axum, and then founded one of the world's most famous monarchical dynasties. The surviving palaces and cult constructions of Ethiopia testify to the achievements of one of the oldest Christian civilizations in the world. Some historical and archaeological sites, such as Axum, Lalibela, Gondar or Debre Damo, are already well researched and documented, but some, such as the temples in the Geralta Valley and the rock churches in Tigray, are still in oblivion [3].

In Lalibela, one of the most famous of all sacred cities in Ethiopia, there is a complex of monolithic churches (Fig. 1), cut down and built in the rock. The churches were built in the 1100s and are a symbolic image of Jerusalem. A unique feature of these objects is the way they were created: the churches are carved from soft volcanic rock and are isolated structures in deep stone pits with long connecting tunnels or trenches. Most likely, the earliest objects carved in the rocks were residential buildings or fortifications, not churches, but in the X and XI centuries AD churches with architectural features were created, which, according to researchers, originate in ancient Axum, which flourished in an even earlier period. An important feature of this monument, which attracts researchers and tourists from all over the world, is the environmental unity of rock churches, expressive landscape and traditional settlements built on the basis of the use of walls from the earth..

Like other Lalibela churches, the Biet Ghiorgis complex (Fig. 2, 3) is carved from natural rocky relief in the form of monolithic volumes, forming both the general shape of the church and details of doors, windows, etc. The church is connected with the rest of the complex through tunnels and transitions in the form of deep trenches.

Geometric proportions in architectural patterns represent the language of design, as well as words in spoken language. The visual expression of the order of these laws is best expressed through the discipline of geometry. Geometry is a model of creation and generator of all forms. Geometrical ratios and proportions existed and were used in the design and construction of stone churches and ceremonial objects Lalibela. They were invariably constructed with the sizes including mathematical numbers, constants and ratios such as golden section, sacred middle, and also on the basis of proportional circles proportional rectangles and triangles. Sacred geometry is the geometry used in planning and construction of religious buildings such as temples, churches, mosques, religious monuments, altars and tabernacles. Review of the main architectural features of the churches in Lalibela and jewelry carved on their surfaces, allows you to understand how little is known about the Ethiopian art of the XII century!

Top view of the 3D laserscan model of the rock hewn churches in Lalibela

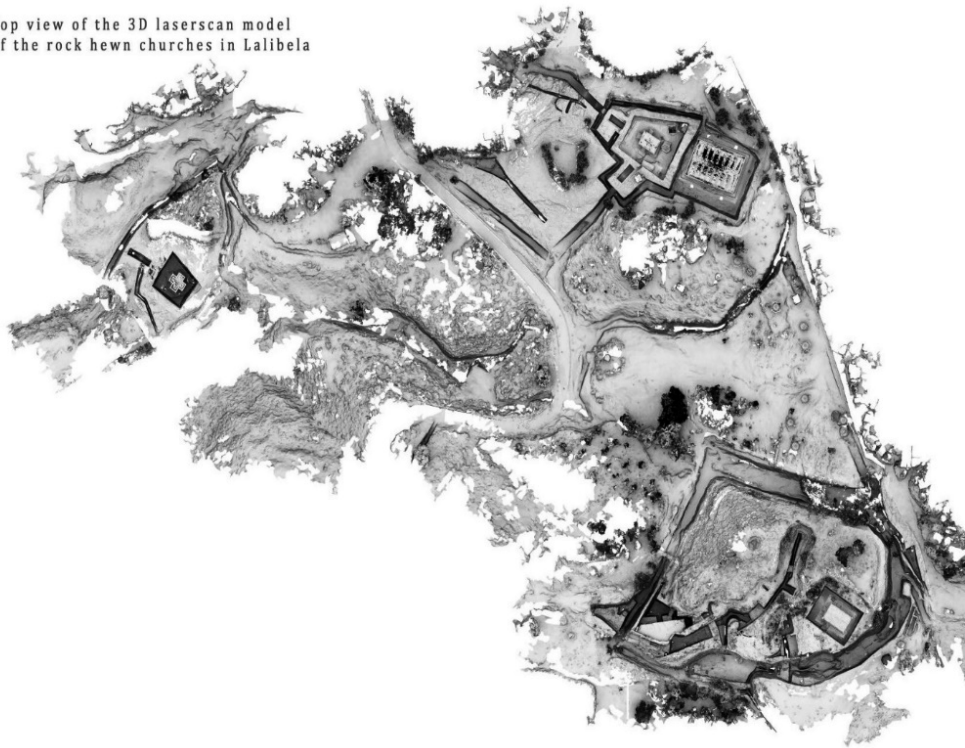


Fig. 1. The complex of rock churches in Lalibela

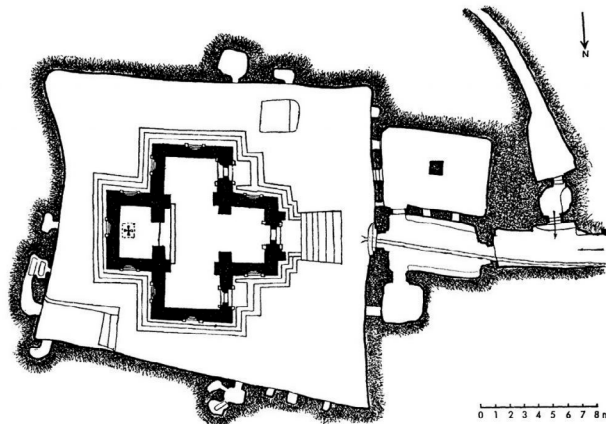


Fig. 2. Rock Church of Biet Ghiorgis in Lalibela. A plan and photographs of the General view

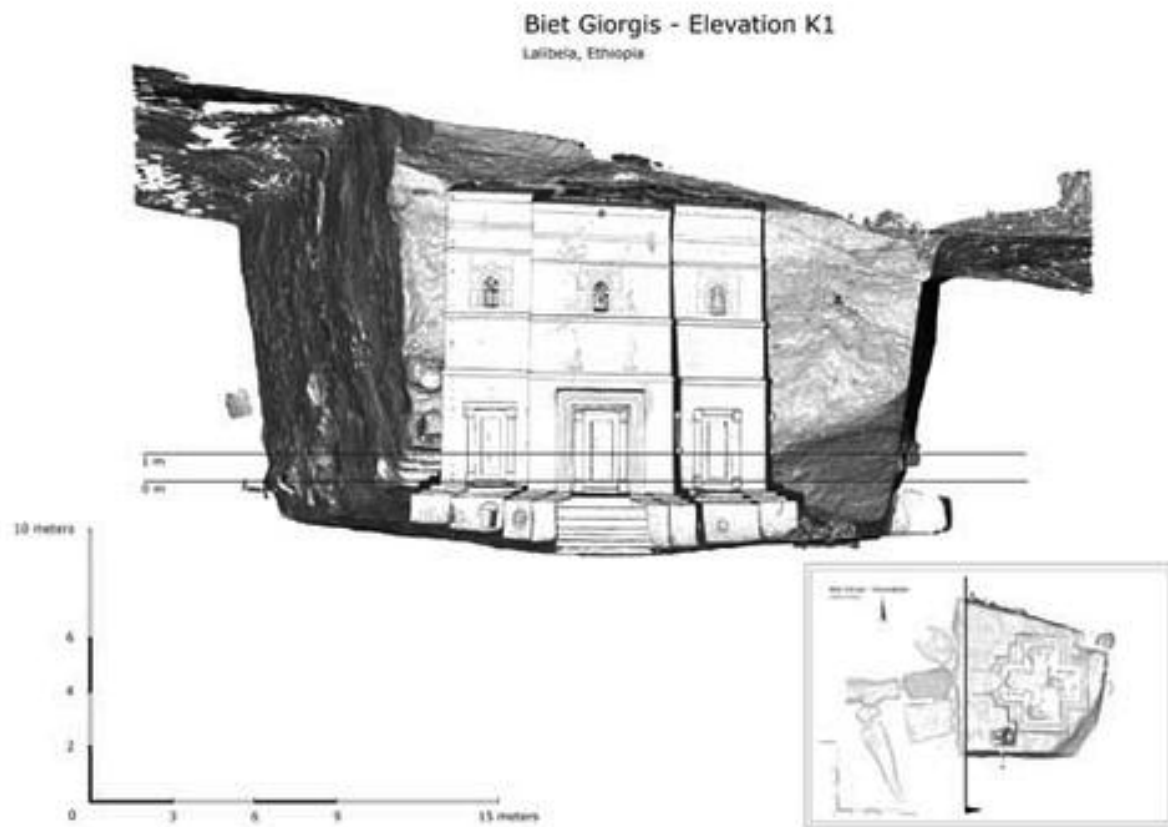


Fig. 3. Biet Ghiorgis Facade of the rock Church Biet Ghiorgis

The tasks of the project experiment in the city of Lalibela:

1. Create a precedent - a sample approach providing the solution of two tasks: 1) preservation in the authentic state of the object representing the valuable cultural heritage and 2) integration of the historical object with the new project.

2. To build an attractive tourist place.

3. Demonstrate the principle of clear distinction between old and new as a way to avoid historical forgery.

4. Balance or harmonize traditional environmental technologies in the new construction system.

5. Justify the protection of two key values: the aesthetic content of the monument and natural resources.

Ratification of the integral environment of the historical complex Lalibela. Rock and earthen architecture. Traditional technologies

- The value of the complex in Lalibela is the synthesis of architectural, historical, environmental and technological aspects. Rock churches, built by the method of sequential cutting of the object from the total massif of land, are supplemented by technologies for the construction of Hadish Adi settlement (Fig. 4), based on clay walls (earthen architecture) [4, 5].

Along with the preservation of unique rock churches, the overall goal of the experiment is to develop a complex project of a tourist zone, including a new hotel and the renovation of a traditional nearby settlement.

To solve this problem, researchers and designers face the problem of research and application of appropriate methods and techniques to improve the preservation of different types of not only rocky but also earthen architecture and the restoration of relevant objects.

The purpose of this cultural mission was to assess the opportunities that earthen architecture offers to improve the overall environment of a World Heritage Site. The objective of the first phase was, inter alia, to examine the potential of earthen architecture for effective conservation and urban management of the Lalibela World Heritage Site as an example. The Lalibela Rock-Hyun (Hewn) ensemble was registered based on the justification of criteria (i), (ii) and (iii). Criterion (iii) particularly refers to the traditional architecture of the site as providing a contextual basis for a World Heritage site. The WHC description and inventory in the nomination dossier clearly includes traditional buildings that are "aesthetically, technically or socially" represent

a valuable quarter for churches". Thus, without these buildings, the object would be incomplete.

Studies confirm that there are a number of problems, including the fact that the greatest threat to traditional architecture is development and demographic pressure. Economic conditions often force people to resort to construction methods other than traditional ones to meet their housing needs. The overpopulation of the Hadish Adi settlement in Lalibela, the emergence of alterations and new buildings make it difficult to assess the beauty of the settlement's holistic historical environment. In general, the study and the project provide sufficient evidence to assert that there is a continuous tradition in the clay architecture of

local buildings, which is constantly evolving in terms of methods and materials. The straw has been replaced by wavy iron sheets, and the stone structure and earth structure is complemented by a wooden supporting structure covered with earth.

Architectural concept of The Art Hotel (Rock Hyun Hotel) in Lalibela city

The project concept of a modern art-rock hotel (Fig. 5) is aimed at creating an environmentally sensitive architecture inspired by the expressive form, material and spatial organization of the historical complex "rock churches" in the city of Lalibela, as well as - the design of a building system



Fig. 4. Urban sprawl of Lalibela, viewed from the Sebat Woyra Hill

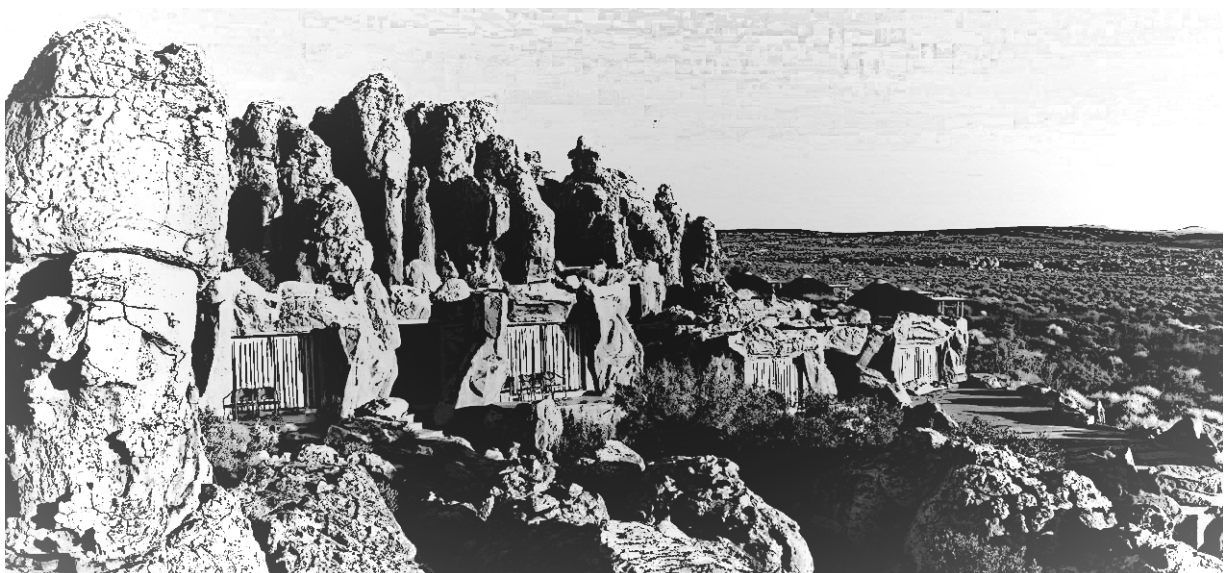


Fig. 5. General view of the Art Hotel (Rock Hyun Hotel) in Lalibela city

based on renewable energy sources. This project was thus conceived as an extension of the historical experience, not as a complement to completely new ideas. Most of the decisions made in the project are based on historical experience, including climate comfort issues.

The layout of the hotel maximizes the use of climate for comfort and offers intimacy and breathtaking views of the valley. The rooms are carved at the back of the hill and offer views to the west and north overlooking the road to Secota. The Cascade Trail links the common exterior spaces from which the hotel rooms are accessed. These areas can also be used as fireplace areas, places for communication and a view of the surrounding landscape. A large observation deck and a recreation area is created in the lower part of the site. Natural ventilation of the premises is provided during the day, while at night the thermal inertia of the stone walls radiates in a closed environment, which reduces the effect of chill due to altitude. This balanced state of the microclimate of the hotel premises is a direct borrowing not only from the historic churches of Lalibela, but also from most traditional African houses. The wet rooms of the hotel rooms are located at the corners to provide natural cross ventilation at any time, with bath, shower and toilet windows overlooking the northern and western landscape respectively. There is sufficient distance between hotel rooms to provide an independent view of the landscape, integrate vegetation and maintain privacy. However, the rooms are located close enough to maintain the atmosphere and image of a small traditional village. The internal components of the hotel blocks are arranged according to the topography in order to enhance the connection of each block with the view. This project may be viewed as a potentially developing system (Fig. 6) that can easily grow in the right direction forming an image and structure similar to a traditional village. Such “spontaneous development” honors the architectural solution of the Art Hotel from the generally accepted formal design of modern hotels.

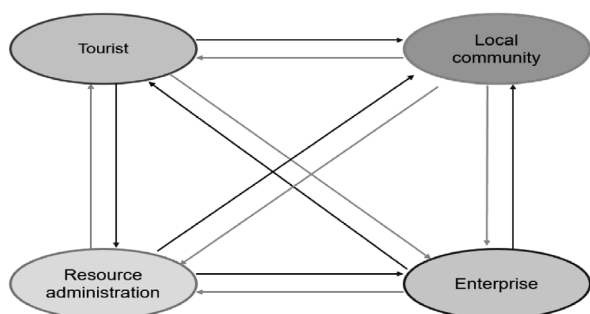


Fig. 6. Technological, environmental and organizational concepts of the project experiment and studies

General strategy of the project. Key findings

1. Rational use of natural material is the way to optimize construction technology at the modern stage of renovation of historical complexes and settlements. Natural stone is a traditional building material. In Ethiopian history, stone has been used as a building material from the earliest stages of civilization. Being a material of natural origin, the stone is available as blocks and can be cut to the required size and shape when used in construction.

2. The experiment of designing a modern art rock hotel is aimed at creating a modern and environmentally sensitive architecture inspired by the power of expression of historical rock churches in the city of Lalibela with the optimal use of renewable energy systems [6–8].

3. The layout maximizes the use of climate for comfort and offers intimacy and breathtaking views of the valley. Natural ventilation of the rooms is encouraged during the day, while the thermal inertia of the stone walls radiates in a closed environment at night to reduce the effect of chill due to altitude. This moderate quality of the room is a direct borrowing not only from the historic churches of Lalibela, but also from most traditional African houses.

4. The Art Hotel project is integrated into the overall world process aimed at finding ways to balance or harmonize environmental technologies.

5. The study and the project must first develop approaches that can demonstrate the relationship in economic, social and environmental dimensions between the four stakeholder groups, namely: - resource management, tourism, local community and businesses.

For this project to be successful, it is necessary to improve cooperation between the administration, local community, tourists and businesses.

Second, it is necessary to offer an optimized method of designing renewable energy technologies in construction, which is based on the traditional architectural design process consisting of architectural circuit design, energy design, construction design and performance evaluation.

Expectation results

1. Tactful and ecologically balanced development of the historical complex in Lalibela will contribute to the development of tourist infrastructure of the region.

2. The tourism successful in creating employment opportunities and brought economic benefits to local community.

3. The enterprise will have apposite effects on local community.

4. Environmentally responsible behavior can lead to the protection of heritage resources.

5. Using Solar reduces carbon emissions and protects the environment while helping the tourism move towards energy independence.

Recommendations

– Study the ecology of the site properly before embarking on building designs.

– Proper legislation that encourages green design methods should be enacted.

– Preserved the natural environmental as much as possible during construction

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Об авторах:

МАЛАХОВ Сергей Алексеевич

профессор, доктор архитектуры,
заведующий кафедрой инновационного
проектирования
Самарский государственный технический университет
Академия строительства и архитектуры
443100, Россия, г. Самара, ул. Молодогвардейская, 244
E-mail: s_a_malahov@mail.ru

MALAKHOV Sergey A.

Doctor of Architecture, Professor, Head of the
Innovative Design Chair
Samara State Technical University
Academy of Achitecture and Civil Architecture
443100, Russia, Samara, Molodogvardeyskaya str., 244
E-mail: s_a_malahov@mail.ru

Мамо Калкидан Адиссу

магистрант
Эфиопия

MAMO Kalkidan Addisu

Designer, Master's Degree Student
Ethiopia

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