

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
Kyiv National University of Construction and Architecture

**ENVIRONMENTAL ASPECTS
OF ARCHITECTURAL DESIGN**

Methodological Guidelines
for Completing Individual Assignments in the Discipline
“Architectural Ecology”
for Students of the Second (Master’s) Level of Higher Education
in Specialty G17 “Architecture and Urban Planning”

Kyiv 2026

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E45

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Environmental Aspects of Architectural Design [Electronic resource] :

E45 Methodological Guidelines for Completing Individual Assignments in the
Discipline “Architectural Ecology” / Compiled by: O. Homon,
G. Kovalska, N. Kantaurova – Kyiv: KNUCA, 2026. – 18 p.

They outline the requirements for completing individual assignments
in the discipline “Architectural Ecology,” define their structure, stages, and
specific features of implementation, and include control questions as well
as examples of completed work.

These guidelines are intended for students of the second (Master’s)
level of Higher Education in Specialty G17 “Architecture and Urban
Planning,” within the Field of Knowledge G “Engineering, Manufacturing,
and Urban Planning.”

E45 **Екологічні** аспекти архітектурного проектування [Електронний
ресурс]: методичні рекомендації до виконання індивідуальної роботи
з дисципліни «Архітектурна екологія» / уклад.: О.О. Гомон,
Г.Л. Ковальська, Н.А. Кантаурова – Київ: КНУБА, 2026. – 18 с.

Містять вимоги до виконання індивідуальної роботи з
дисципліни «Архітектурна екологія», розкривають її структуру, етапи
і особливості виконання, наведено запитання до контрольного
опитування, а також приклади виконання роботи.

Призначено для здобувачів другого (магістерського) рівня вищої
освіти спеціальності G17 «Архітектура та містобудування» галузі
знань G «Інженерія, виробництво та містобудування».

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GENERAL PROVISIONS

The discipline “Architectural Ecology” is an elective academic course designed for students pursuing a Master’s degree (second level of higher education) in specialty G17 “Architecture and Urban Planning.” The course is studied over the duration of one semester.

Like any scientific field, Architectural Ecology possesses its own terminological framework that defines its object, subject, purpose, and objectives.

The object of study is the “population–environment” system, also known as the demoecosystem.

The subject of the discipline includes legislative acts and national programs aimed at ensuring ecological balance between the natural and anthropogenic components of the urban environment; the study of processes for stabilizing and improving the state of the environment through architectural and urban planning means; and the analysis of ecological principles and consequences of professional activity in the field of architecture.

The purpose of the course is to develop ecological thinking in students when solving practical tasks in the process of researching and designing architectural and urban planning objects of various types and levels of complexity.

The discipline provides students with an understanding of the conceptual foundations of ecology as a modern, interdisciplinary science, fosters knowledge of the patterns of functioning of complex living systems, and promotes the formation of an ecological worldview as well as the integration of ecological architecture principles into the theory and practice of architectural design. The course is aimed at addressing ecological challenges in the process of creating architectural objects.

The main objectives of the discipline involve the theoretical and practical training of students in the following areas:

- understanding the essence of the concept of the environment and the principles of its ecological balance;
- familiarization with the issues of human interaction with the natural and artificial living environment;
- studying the requirements for architecture and urban planning regarding the rational use of natural resources;
- mastering the principles and methods of organizing an ecologically balanced environment at various stages of architectural design;

- understanding the interrelation between ecological objectives of stabilizing and improving environmental parameters and architectural solutions;
- revealing the ecological foundations and consequences of an architect's professional activity;
- familiarization with the fundamentals of urban ecology, principles of architectural design, and construction of buildings and structures that meet ecological requirements.

The electronic educational and methodological support for the discipline is available on the Educational Website of KNUCA: <http://org2.knuba.edu.ua>. (<http://org2.knuba.edu.ua/>)

PURPOSE AND OBJECTIVES OF THE PRACTICAL ASSIGNMENTS

The purpose of the practical work is to expand and deepen students' knowledge of the impact of architectural and urban planning activities on the environment, as well as to familiarize them with the main environmental problems of the architectural environment and possible ways to address them.

Carrying out the practical tasks contributes to the practical assimilation and consolidation of the theoretical principles of the course.

The practical assignments includes the following components

1. Illustrative part – creation of a presentation (PowerPoint, Google Slides, etc.).
2. Project part – development of a conceptual architectural solution or model.

STAGES AND STRUCTURE OF THE PRACTICAL ASSIGNMENTS

1. PRESENTATION

The task involves preparing a presentation in PowerPoint, Google Slides, or similar software, following a sequence of slides based on the chosen essay topic.

Main requirements for the presentation design:

- slide 1 – title page;
- slide 2 – table of contents;

- subsequent slides – content development of the topic; the slides should include graphical materials and brief descriptions of diagrams and tables that reveal the chosen essay topic;

- final slide – list of references;

- the minimum number of slides for one presentation is 12 slides.

Examples of presentations are provided in Appendix 1.

LIST OF TOPICS FROM THE SECTION “ARCHITECTURAL ECOLOGY”

1. Ecology – the science of the interaction between living organisms and the environment. Objectives of nature conservation.

2. Use of solar energy in architecture: passive and active solar systems.

3. Architectural solutions for harnessing wind energy.

4. Low-potential energy of the Earth: geothermal systems in construction.

5. Energy-efficient building form: the relationship between architecture and climate.

6. Green standards and certification of energy-efficient buildings (LEED, BREEAM, DGNB).

7. Comprehensive ecological strategy of a building: integration of natural energy sources.

8. Green architecture – a contribution to the planet’s future. Buildings with vertical landscaping.

9. Green architecture: green roofs, “living walls,” and vertical farms.

10. Architecture of eco-skyscrapers. Reality and futurological concepts

2. CONCEPTUAL PROJECT

A conceptual project is a means of expressing the student’s creative individuality and their ability to independently solve a specific design task within a short period of time. The conceptual project provides an opportunity for the student to demonstrate their creative identity. The project is developed based on the chosen essay topic.

The purpose of the conceptual project is to demonstrate the acquired theoretical knowledge and practical skills in the discipline, as well as to develop the student’s creative individuality.

Requirements for completing the conceptual project

1. The conceptual project is carried out independently by the student, revealing their creative potential and understanding of the main essence of the task.
2. When developing the volumetric-spatial and planar composition, it is necessary to take into account the main compositional principles, such as the compositional center; the dynamism or static nature of the composition; axial, symmetrical, diagonal, or mixed compositional techniques; contrasting or nuanced relationships between parts and the whole; rhythm, etc.
3. A comprehensive approach should be applied to the proposed solution – that is, along with the artistic and compositional concept, the main general ideas about functional interrelations and structural aspects should also be reflected.
4. The project is executed using a sketch presentation technique (graphic) that best corresponds to the project's idea and clearly conveys the concept of the volumetric-spatial or planar design.

Execution of the conceptual project

The project is carried out on an A3-format sheet of drawing paper. The sheet should include areas for idea development, imagery, associations, and variants of the volumetric-spatial composition. Typically, a large central area is reserved for the presentation of the selected final solution. The final version is executed in architectural graphics, using ink, markers, colored pencils, watercolor, or computer modeling.

Examples of conceptual projects are provided in Appendix 3.

CRITERIA FOR EVALUATING INDIVIDUAL ASSIGNMENTS

Within the time frame established by the curriculum, the individual work is submitted for review and is evaluated according to the following criteria:

1. Structure of the presentation (based on the chosen topic) and its compliance with the assignment.
2. Content quality – completeness and depth of coverage of the selected topic's key points.
3. Accuracy and clarity of the presented material.

4. Conceptual project – originality of ideas and imagery, quality of the volumetric-spatial composition on the sheet, and consistency with the chosen topic.

RECOMMENDED LITERATURE

1. Kucheryavy V.P. General Ecology: Textbook / V.P. Kucheryavy. – Lviv: Svit, 2010. – 520 p.

2. Tsyhychko S.P. Fundamentals of Ecological Formation of Architectural Objects // Scientific Bulletin of Construction. – Kharkiv: KDTUBA, 2010. – Issue 59. – P. 25–29.

3. Kucheryavy V.P. Urboecology: Textbook. – Lviv: Svit, 2001. – 440 p.

4. KNUCA Library. – Electronic resource. – Available at: <http://library.knuba.edu.ua/> (accessed: 23.01.2024). – Title from screen.5.

5. Alanna Stang, Christopher Hawthorne The Green House. New Directions in Sustainable Architecture. – Princeton Architectural Press, 2010. – 196 p.

6. Alastair Fuad-Luke Ecodesign: the Sourcebook. – Chronicle Books, 2010. – 352 p.

7. Jodidio Philip. Green architecture Now. – Hong Kong, London, Paris, New York : Taschen, 2009. – 416 p. : il.

8. James Wines. Green Architecture. – London: Taschen, 2008. – 240 p. : il.

9. Terry Williamson, Antony Redford, Helen Bennetts. Understanding Sustainable Architecture. Spon Press is an imprint of the Taylor & Francis Group, 2003. – 173 p.

10. Edward Mazria. The Passive Solar Energy Book (Expanded Professional Edition). Published January 1st 1979 by Rodale Press. – 687 p. ISBN 0878572384 (ISBN13: 9780878572380).

11. T. Agami Reddy. The Design And Sizing Of Active Solar Thermal Systems. Published September 3rd 1987 by Oxford University Press, USA. – 416 p. ISBN0198590164 (ISBN13: 9780198590163).

12. Gopal Nath Tiwari, Neha Gupta. Photovoltaic Thermal Passive House System 1st Edition. CRC Press 1st edition August 18, 2022. – 450 p. ISBN-10: 1138333557 (ISBN-13: 978-1138333550).

13. Richards Ivor. Ken Yeang. — China: E image Publishingco skyscrapers, 2007. – 159 p. : il.
14. Werthmann Christian. Green Roof : A Case Study. – Princeton Architectural Press, 2007. – 160 p. : il.
15. BREEAM. BREEAM Communities technical manual. BREEAM 2017. URL: <https://files.bregroup.com/breeam/technicalmanuals/communitiesmanual/> . (date of access: 27.10.2025).
16. BREEAM. BREEAM scoring and rating. BREEAM Communities technical manual 2017. URL: https://www.breeam.com/communitiesmanual/content/00_introduction/05_scoring_and_rating_proposals.htm . (date of access: 27.10.2025).
17. LEED. LEED RATING SYSTEM. Expanded Shale, Clay and Slate Institute (ESCSI) 2009. URL: <https://www.escsi.org/sustainability-without-compromise/leed-rating-system/> . (date of access: 27.10.2025).

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

Kyiv National University of Construction and Architecture

Department of _____

«TITLE»

Completed by: student _____ group ____

Reviewed by: _____

Kyiv 20__

EXAMPLE OF PRESENTATION

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
Kyiv National University of Construction and Architecture

Department of architectural theory and architectural design

“DESIGNING A PASSIVE HOUSE AND PASSIVE SOLAR ENERGY”

Prepared by: Nabil El Hamdani
Survey: prof. Olha Homon

KYIV 2025

CONTENTS

CONTENTE

- Introduction
- What is a Passive House?
- Principles of Passive Design
- Passive Solar Energy
- Benefits of Passive Houses
- Case Study of Passive House Design in Morocco
- Challenges and Future Prospects
- Conclusion
- References

MAIN TEXT



INTRODUCTION

- As global energy consumption rises, the need for energy-efficient buildings has become more critical.
- The concept of a Passive House focuses on reducing energy consumption by harnessing natural resources.
- In Morocco, where the climate is warm and sunny, passive solar design is an ideal approach to creating energy-efficient homes.

MAIN TEXT



BENEFITS OF PASSIVE HOUSES

- Energy savings: Reduces heating and cooling costs by up to 90%.
- Sustainability: Reduces reliance on fossil fuels, contributing to lower CO2 emissions.
- Comfort: Stable indoor temperatures with better air quality due to ventilation systems.
- Long-term cost savings: Lower energy bills and maintenance costs.

CONCLUSIONS

CONCLUSION

Designing passive houses is essential for sustainable architecture and energy efficiency. By incorporating passive solar energy, architects can create buildings that are not only environmentally friendly but also cost-effective in the long term.

In Morocco, passive design is a promising solution for meeting both environmental and energy challenges.



REFERENCES

REFERENCES

1. Passive House Institute
2. Website: <https://passivehouse.com>
3. Accessed: October 21, 2024
4. EcoBuilding Pulse: Passive Solar Design in Warm Climates
5. Website: <https://www.ecobuildingpulse.com>
6. Accessed: October 21, 2024
7. Energy.gov: Passive Solar Design
8. Website: <https://www.energy.gov/energysaver/passive-solar-home-design>
9. Accessed: October 21, 2024
10. Architectural Review: Solar Architecture in Hot Climates
11. Website: <https://www.architectural-review.com>
12. Accessed: October 21, 2024
13. Green Building Advisor: Designing for Energy Efficiency
14. Website: <https://www.greenbuildingadvisor.com>
15. Accessed: October 21, 2024



**QUESTIONS FOR THE CONTROL ASSESSMENT IN THE SUBJECT
“ARCHITECTURAL ECOLOGY”**

1. Description of the ideal city in the works of Plato, T. More, and C. Fourier
2. Arcology, Metabolist architects
3. Ecological footprint, linear and circular metabolism
4. Main directions of ecologically oriented architecture
5. Essence of the sustainable development concept
6. Key tasks to achieve sustainable development
7. Influence of volumetric-planning solutions and building form on energy efficiency
8. Natural-climatic and architectural-planning factors of energy efficiency
9. Principles of designing energy-efficient buildings
10. Energy-efficient structures, systems, and building materials
11. Ecological city: design requirements
12. Regulation of wind, noise, and aeration regimes in the city
13. Architectural-planning methods for microclimate formation
14. Criteria for evaluating greened areas and environmental protection measures
15. Urboecosystem and consequences of anthropogenic impact
16. Solar energy: passive and active solar systems
17. Principles of the recuperator and Michel-Trombe wall
18. Wind energy: operation of a wind generator, examples of application
19. Geothermal energy and building heating systems
20. Ventilated façade and double façade
21. ETFE film: properties and examples of structures
22. Architectural techniques for optimizing solar exposure, ventilation, heating, and cooling in atrium buildings
23. Functions, forms, and placement of atria in public and residential buildings
24. Ecological principles in atrium architecture and building renovation
25. International environmental protection system
26. Global certification systems (LEED, BREEAM, etc.)
27. “Green building” ecological standards
28. Architectural-ecological analysis of the Commerzbank building in Frankfurt
29. Ecological solutions in the City Hall building in London

EXAMPLES OF CONCEPTUAL PROJECTS ON THE TOPICS OF TERM PAPERS

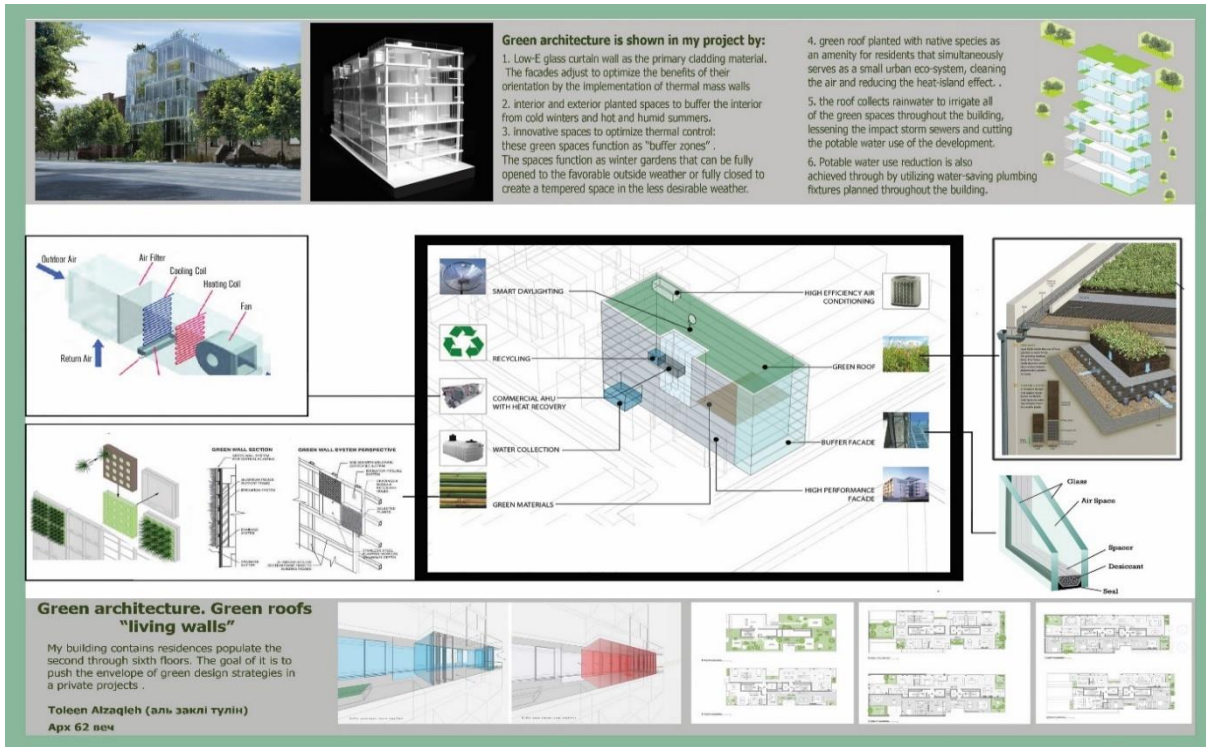


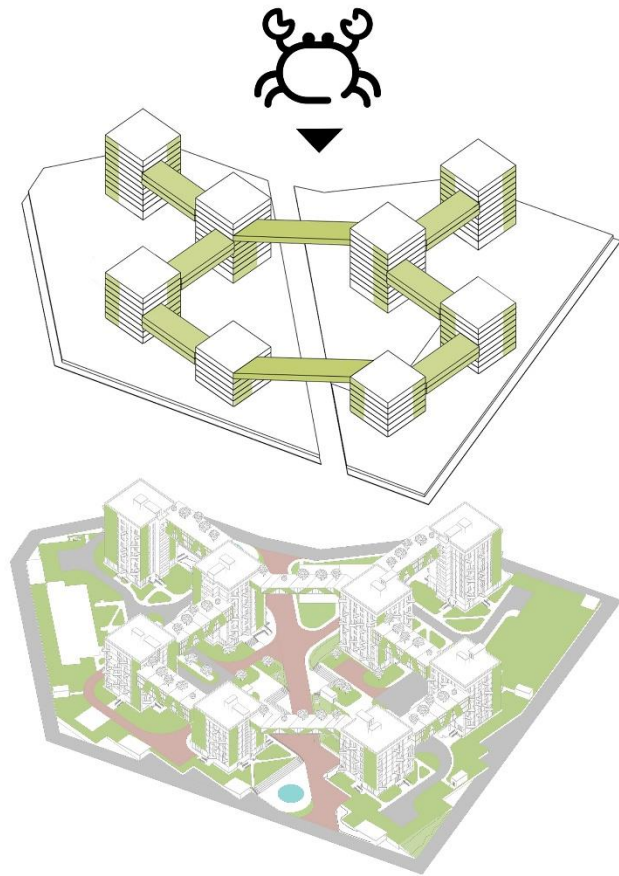
Fig.1. Conceptual project on the topic: "GREEN ARCHITECTURE. GREEN ROOFS «LIVING WALLS", prepared by – Toleen Munther Alzaqleh. Supervisor –Prof. Olha Homon



Fig. 2. Conceptual project on the topic: "ARCHITECTURE OF ECO-SKYSCRAPERS. REALTY AND FUTUROLOGICAL CONCEPTS", prepared by – Oussama Bouzidi. Supervisor –Prof. Olha Homon

Зелена архітектура - внесок в майбутнє планети
Будинок з вертикальним озелененням

Вик. ст. гр. АРХ-67
Ковтуненко Ю.
Лазарева М.
Гладун С.



Основна мета і концепція проєкту:

Забезпечити взаємозв'язок житлової будівлі і природи, збільшити площу озеленення та покращення якості повітря через зменшення рівня CO₂, завдяки поглинанню його рослинністю, та збільшити кількість кисню в повітрі. Покращена якість повітря та єдність з природою позитивно впливають безпосередньо на якість життя людей.
Концепція полягає у створення вертикального озеленення яке поєднує декілька різновидів рослин, що розміщуються на вертикальній поверхні утворюючи неповторний візерунок. Такий вид озеленення буде поглинати сонячне тепло влітку та створювати прохолоду у приміщенні комплексу. Також рослини будуть затримувати пилю та інші органічні сполуки тому буде покращена якість повітря, знижено рівень шуму.



Fig. 4. Conceptual project on the topic: "GREEN ARCHITECTURE A CONTRIBUTION TO THE FUTURE OF THE PLANET. A BUILDING WITH VERTICAL GREENING", prepared by – Kovtunenکو Yu., Lazareva M., Hladun S. Supervisor – Prof. Olha Homon

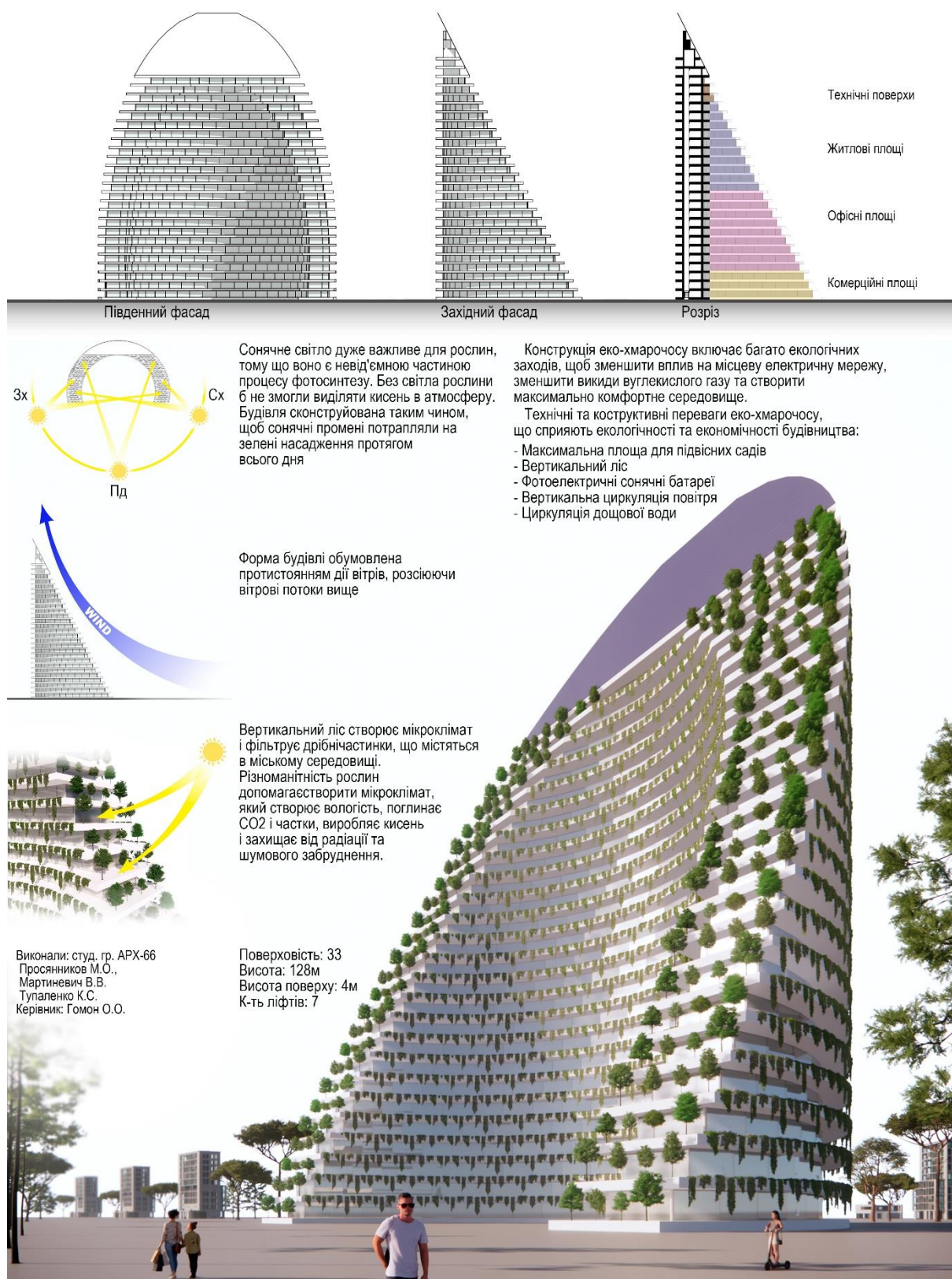


Fig. 5. Conceptual project on the topic: "ARCHITECTURE OF ECO-SKYSCRAPERS: REALITY AND FUTUROLOGICAL CONCEPTS", prepared by – Prosiannykov M., Martynovich V., Tupalenko K. Supervisor – Prof. Olha Homon

Educational and Methodological Publication

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