Architectural approaches to the formation of ecological culture among the populationy

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Abstract. Today, ecology has become one of the priorities of domestic and international politics. The article analyzes the state of the modern environment, and also puts forward proposals for the use of various approaches when designing housing in order to increase the level of awareness of the population on the topic of environmental problems. Collecting recyclable materials, recycling waste, and sharing consumption occurs more efficiently if appropriate locations and approaches are provided at the design stage. Responsibility for the state of the environment lies not only with the state and corporations, but also with citizens, therefore the development of environmental habits through an integrated approach of designers, and not through the willpower of an individual, should become a priority.

1 Introduction

Currently, environmental protection issues have become particularly important. They are covered both in state media and in news channels and social networks. Ecology has become one of the priority areas of international policy, and not only is reducing the degree of environmental pollution, but also supporting projects for sustainable architecture and environmental management [1].

According to Rosstat, there is an increase in the volume of investments in fixed assets related directly to environmental activities and waste disposal activities [2]. In 2015, the figure was 0.9% of total investments; in 2022, this figure increased almost one and a half times and amounted to 1.2%. This dynamics primarily indicates the prospects of the area of activity under consideration.

It is difficult to overestimate the importance of a competent design approach, especially when creating residential buildings. In these conditions, a person spends most of his time, thus it can be argued that a properly designed environment shapes character and, mainly, habits, including environmental ones. It is the cultivation of a new culture of relationships between man and nature that will serve to solve the problems of sustainable development and ecology [3].

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The importance of focusing specifically on residential multi-apartment development is evidenced primarily by statistical data. Every year the volume of housing commissioning is growing rapidly (Fig.1). In particular, the number of apartments built in 2023 is 12.3% higher than the number delivered during the same period in 2022 [4, 5].

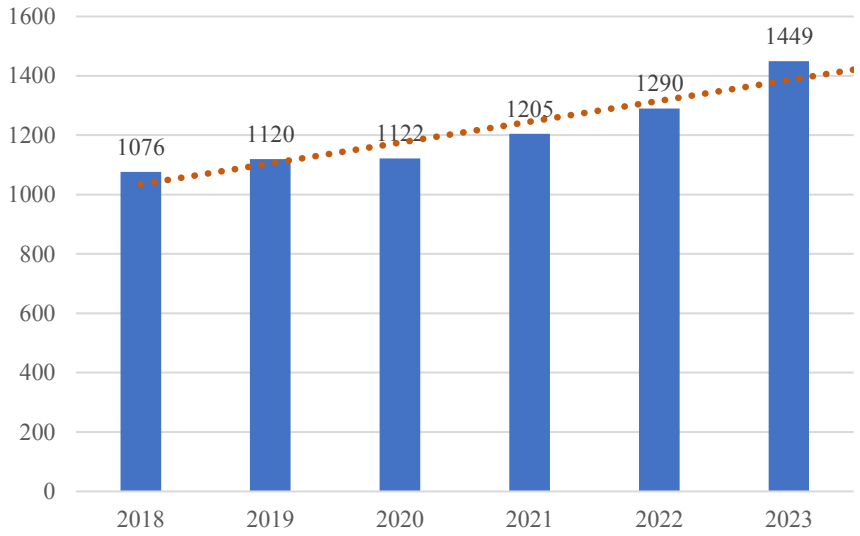

Fig. 1. Number of apartments built in 2018-2023. According to Roskomstat.

These data determine the relevance of considering promising areas of development and implementation of new highly efficient technologies and principles of sustainable development. In addition, developments are currently underway to create environmental standards. There are already systems for assessing the sustainability of construction projects, such as the English BREEAM certification system. They look for factors such as energy, comfort, transport, system control, materials, water, waste management and pollution. The article examines precisely these factors as determining the development of the ecological culture of the population.

In Russia, since 2018, “Green” standards have been in force (GOST R 70346-2022 for residential apartment buildings), as well as EGBS - a rating system for the sustainability of buildings [6]. Moreover, both designed facilities and projects already put into operation receive certification. The system complies not only with Russian standards, but also with international sustainable development strategies. It can be concluded that at the moment in Russia, special attention is paid to the development of environmental design standards, as well as conducting examinations and certification of existing capital construction projects.

2 Methods and relevance of the study

To solve the research problems, this article uses a review and analysis of the literature. The main focus of the article is on multi-storey buildings. This choice is due to the fact that in individual construction greater freedom of action is possible for property owners. In apartment buildings, the way of life directly depends on the decisions of the designers, and not on the wishes of future residents. Therefore, close interaction between architects and future residents will make it possible to foresee possible scenarios to the greatest extent and

lay down the conditions for the development of useful habits. What will be an invaluable contribution to the future development of the country, ensuring the successful solution of environmental problems.

The purpose of this study is to identify architectural and urban planning techniques that would serve as an incentive for the development of useful environmental habits among the population. Currently, responsibility for the state of the environment is being transferred into the hands of ordinary citizens, relying solely on their willpower and discipline. Such an approach cannot be reliable and durable, which is why it is so important to develop methods of influencing residents that would create conditions not only for the development of habits, but also for their successful consolidation in everyday behavior [7]. Therefore, this article highlights not only large-scale transformations, but also ideas of sustainable development that will work effectively at the local level within the same family.

3 Ecological principles

3.1 Using eco-friendly, durable materials

The use of eco-friendly materials is undoubtedly a popular method among architects and designers. Such materials are not only safe during the operation of buildings and structures, but also give residents a sense of unity with nature. This in turn helps to increase awareness regarding environmental issues. With daily interaction with materials such as wood, bamboo, natural fabrics, and ceramics, a feeling of closeness to nature is formed.

As numerous studies show, a large area of greenery and natural materials make a person feel happier [8], which in turn helps to find the energy and time to take care of the environment. This allows us to instill in citizens a responsible attitude towards their environment. By expanding their environmental horizons, people will cultivate a sense of duty, because a person will directly realize and feel the consequences of a wrong choice [9].

By investing in the development of high-quality, durable materials, you can extend the operational life of a building, thereby reducing the burden on the environment. Reducing resources and energy consumption is an important task for the designer. In Russia, the development of environmental requirements for housing increases the level of responsibility of builders and encourages them to use durable, environmentally friendly materials [10].

In turn, companies can draw the attention of real estate buyers to the materials used in projects. This can not only increase commercial success, but also increase the awareness of ordinary consumers, because construction is one of the main anthropogenic factors influencing natural conditions [11]. Drawing attention to this important issue will help city residents be more knowledgeable about purchasing future housing, take a more responsible approach to choosing materials during renovations, and purchasing more environmentally friendly decorative items and household products. All this can have a positive impact on the environment in the future, especially in the long term.

3.2 Creation of collection points for secondary raw materials on the territory of a residential complex or neighborhood

The amount of household waste is increasing year by year. According to Roskomstat, in 2023, out of 560 billion rubles of current costs for environmental protection, 207 billion rubles were spent on waste management. The solution to this problem is the collection and processing of secondary raw materials. However, there are not enough recycling collection points. As a rule, such points accept waste from industrial enterprises and are located outside urban areas. Thus, conditions have not been created for the removal and further processing

of waste from individual farms. The current situation involves the removal of garbage waste by a city dweller in a personal car at distant intervals in order to transport as much recyclable material as possible in one trip. All this time, garbage must be stored in the apartment, which requires a large free area These opportunities have not all residents.

That is why the design of temporary pavilions for the reception of secondary raw materials becomes especially important. In Russia, competitions are held to develop such pavilions, so the topic is truly relevant [12]. The mobile, small-sized building will fit perfectly into existing courtyards and built-up areas. Thus, residents of a neighborhood or residential complex will have an accessible opportunity to collect recyclable materials.

The creation of small points for receiving raw materials can be an effective means in the fight for cyclical consumption. This solution contributes to the creation of new jobs and a reduction in unemployment - the so-called “green employment” [13]. It should be noted that such workers must have sufficient competence to advise the population on the correct sorting of household waste. Currently, measures are being taken in Moscow to organize separate waste collection, mainly by placing two containers in courtyard areas: for raw materials suitable for recycling, and for contaminated waste. Indeed, the acceptance of secondary raw materials has significantly increased its volumes [14]. However, it should be noted that not all citizens have sufficient knowledge to properly sort waste. It is for this reason that a consultant working in a temporary pavilion would be an excellent assistant when questions arise regarding waste separation, in addition, he would control the process of receiving raw materials, excluding incorrectly sorted waste. This is especially important, because during the processing process, foreign impurities in the batch can negatively affect the production process itself and the finished product, which is extremely undesirable in the context of recycling.

In general, accepted secondary raw materials are usually divided into several large categories: glass, waste paper, metal, plastic and other waste.

The glass must first be cleaned of labels and other contaminants and the lids removed. Some companies require glass to be divided into colored and transparent.

When collecting waste paper, it is important to separate recyclables from glossy paper. It is gloss that cannot be recycled, since it is a composite material. In addition, some organizations have requirements regarding the separate collection of colored and office paper. This is necessary to ensure a predictable color of the finished product. Before handing over recyclable materials, it is important to check for the absence of metal elements (paper clips and staples), since they can ruin the whole batch.

Like glass, products made of tin and aluminum must first be cleaned of dirt and labels removed. The finished sorted raw materials should be crushed as much as possible.

When sorting plastic, the first clue is the product labeling. There are 7 plastic markings in total, the first (PET or polyethylene terephthalate) is the most common. Bottles are made from such plastic, this category is actively recycled, sorting plastic with such markings does not cause difficulties even for a person who has never been interested in separate waste collection. However, other categories of plastic usually pose challenges. Thus, the third category (PVC or polyvinyl chloride) is rarely used for recycling, as is the sixth category (PS or polystyrene). The seventh category, designated Other, cannot be recycled. Undoubtedly, such an amount of information can confuse and confuse a person who has just started separate waste collection. This confirms the need to train highly qualified consultants who could guide the population in matters of proper sorting of household waste.

It is also possible to organize a composting system; large volumes of food waste are now an acute social, environmental and ethical problem that worries scientists [14]. The average city dweller does not organize his life taking into account the processing of such waste; it is hardly possible to find a mechanism in the apartment for grinding food waste in the kitchen, which is then disposed of separately from other waste.

The topic of composting is developed mainly in rural areas, but in apartment conditions this idea is not popular. This is due to the lack of free space and time, as well as the necessary knowledge. Therefore, by designing an organized place for receiving food waste, architects provide the city with a competent and safe composting system, which results in natural fertilizers, which will undoubtedly benefit the environment.

The prospects of this method of recycling organic fractions are evidenced by the design and construction of waste composting facilities. According to the Russian Environmental Operator, currently 18 such facilities have been put into operation [16]. In addition, in 2023, GOST for the treatment of food waste (both leftover food and expired products) was adopted. We can conclude that this area of recycling will be increasingly in demand in the future.

3.3 Creation of filtered water points directly in buildings

One of the pressing problems today is the quality of drinking water. Although in general tap water meets sanitary and hygienic requirements, in many places the organoleptic properties of water are not high enough [17, 18, 19]. This is partly due to the state of the water supply infrastructure, partly due to the quality of water treatment. Therefore, city residents need to either install water purification systems in their apartments themselves or buy bottled water. In this regard, the use of PET plastic is an urgent problem, in particular this applies to plastic water bottles. Although separate waste collection in the presence of appropriate infrastructure within walking distance simplifies the situation [20], in general the problem remains. Given two options, a person always strives to choose the more convenient and faster solution. Therefore, creating drinking water dispensing points directly in buildings in common areas is a good solution. This way, you won't have to buy bottled water every time, overpaying for the container and causing damage to the environment. Thus, residents will have the opportunity to access high-quality drinking water at any time of the day. Additional information stands will be able to provide residents with the necessary knowledge about water purification, which will increase the level of public confidence and involvement in environmental problems.

Another solution could be to install water purification filters directly during housing construction. Filters must be included in the estimate at the design stage. With this approach, the need to use plastic containers is completely eliminated, since access to drinking water is provided directly in the apartment - usually in the kitchen.

3.4 Improvement of public services

In addition, city residents often note a lack of trash cans in recreational areas. Indeed, with the exception of the solid food waste collection area, there are hardly any bins to be found. Thus, even a conscientious citizen is forced to resort to throwing garbage in places not designated for this. You can't limit yourself to just a fine, because a competent system for placing garbage containers in the city is also important. Thus, Japanese studies indicate a close relationship between the distance of bins with separate waste collection from pedestrian paths and the amount of recyclable materials submitted for recycling [21]. The less accessible areas for organized waste collection, the lower the collection of waste, in particular waste ready for recycling. Having access to trash cans and containers helps to reinforce the habit of putting garbage in designated special places. Thus, city planners will be able to significantly make the task easier for citizens by placing the necessary equipment within close proximity to traffic routes and in crowded places (this may be especially true at intersections of directions).

3.5 Creation of green roofs and plantings

The use of green roofs and plantings can lead to similar results as the use of natural materials. Daily interaction with the elements of nature will increase the level of awareness of city residents regarding the state of their environment. An important factor is the possibility of organizing gardening activities. Creative activities should encourage people to be more responsible about preserving the environment, personally participating in this process.

3.6 Allocating space in residential cells for separate waste collection

Even at the design stage, it becomes important to foresee possible future scenarios. As a rule, the idea of separate waste collection causes rejection among ordinary residents. First of all, they argue this by the lack of necessary conditions. In the first place is the lack of free space for sorting. That is why, even at the design stage, it is necessary to allocate space for separate waste collection. According to popular instructions and advice, it is possible to design taking into account the placement of two containers: for household waste and secondary raw materials [22].

Following the example of foreign countries, it is worth noting that this is most conveniently implemented in the kitchen, since garbage waste is often cleaned with running water before sorting. As a rule, the bulk of waste is generated in the kitchen during the cooking process: plastic packaging for vegetables, PET bottles, glass and cardboard packaging, tin cans, etc. Having direct access to water in the kitchen will allow you to quickly and efficiently clean the garbage before sorting it into containers here.

3.7 Joint measures for landscaping

Subbotniks are considered to be a relic of the past. However, they can significantly improve the state of the environment, and not only by means of cleaning the area. People taking part in such events are aware of their personal responsibility for the state of nature; they are more conscious of their actions, because they are personally involved in its conservation. Moreover, social connections between neighbors are being established, which also contributes to a more careful attitude towards the environment. The priority should be to increase the attention of compatriots to their own indirect impact on the environment, which is currently less developed [23]. As an element of motivating residents to participate in such events, it is possible to consider providing a discount as part of the fee for the use of common property.

Here the means of architecture and design can also come to the rescue. It is possible to create temporary pavilions for storing necessary equipment and cleaning supplies. It can also be stored in designated areas in common areas. Information stands here will help improve the knowledge of residents and encourage them to participate in joint waste collection and landscaping.

3.8 Collaborative consumption

Currently, the concept of “Zero Waste” has become particularly widespread. According to it, it is necessary to reduce consumption as much as possible. This is possible through various means: sorting and recycling waste, reducing purchases, reusing various things. The last point is important in a lifestyle that meets the “Zero Waste” concept.

Often people get rid of things that are in excellent or even new condition, throwing them away with the rest of the waste. However, a more competent solution would be to use such items for other purposes, or transfer and sell. The spread of the latter option can be facilitated

by planning decisions. So, it is possible to create a point for the exchange of things (for example, items of clothing); another solution could be to install a stand for bookcrossing - the process of transferring and exchanging printed versions of books. This movement has become quite widespread, since it forms an entire social movement, strengthens social ties between people, and increases interest in reading (especially among the younger generation [24]). Also, in the process of developing a project of design solutions, it is possible to place information stands, which would also reflect the issues of the impact of the printing industry on the environment and the importance of reusing already produced things. This, in turn, would develop a useful habit among the population of giving things a second life before throwing them in the trash.

4 Conclusions

Thus, by using simple design methods and techniques, it is possible to increase the level of awareness of the population regarding environmental issues. Also, an integrated approach makes it possible to instill healthy habits in residents, simplifying the task of the population, creating comfortable conditions for nurturing correct behavior patterns. By correctly integrating the necessary tools, designers will allow citizens to encourage the development of such habits in themselves and the younger generation.

The acute social problem of environmental protection will no longer cause fear and misunderstanding among the average resident, and separate waste collection and other habits will no longer seem unattainable in everyday life. Often it is the fear of the unusual that makes us quit what we started. By reducing the degree of uncertainty, architects will be able to reduce the level of anxiety of citizens and think about environmental problems as difficulties that can be solved through collective efforts.

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