

Renovation of former industrial areas by BREEAM in city of London

Valery Telichenko, Andrey Benuzh* and Dmitry Morozov

Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow, 129337, Russia

Abstract. The main focus at this article on BREEAM Community scheme which planning of large-scale developments taking into account the use of former industrial areas. Construction on such lands of new modern areas is beneficial for both the developer and the city. In this case, it is ideally possible to show the use of "green" technologies and standards with aim of increasing the environmental situation of the areas, the creation of reactionary zones. The article describes three steps involved in the assessment of sustainability at the masterplanning level and five assessment categories which are considered through appropriate criteria. Was made a diagram of division into types of reconstructed objects and their inherent functions after reconstruction. Considered an example of Renovation of former industrial areas by BREEAM at King's Cross in London.

1 Introduction

The most common and well-known international environmental system in construction is the method of assessing performance of buildings by BREEAM (BRE Environmental Assessment Method) [1], created in 1990 by the British company BRE Global (The Building Research Establishment) and used at this time in 81 countries [2]. To date, more than 567 189 buildings have been certified and more than 2 277 040 buildings have been registered for certification by BREEAM.

2 Scope of the work

The method of the BREEAM assessment system is the method of scoring in several sections relating to different aspects of the impact on safety for the environment, and life, comfort. A characteristic feature of BREEAM is that the points are multiplied by the weight coefficients reflecting the relevance of the aspect in the area of development, then summed up and translated into the resulting assessment, which is to assign a rating: Acceptable - "certified" (only in the scheme In-Use), Pass - "satisfactory", Good - "good", Very Good - "very good", Excellent - "excellent", Outstanding - "excellent". A rating of 1 to 5 stars is also awarded. This technique allows you to take into account the specifics of a particular

* Corresponding author: BenuzhAA@mgsu.ru

region when adapting BREEAM without compromising efficiency. (BREEAM New Construction Technical Manual, 2014) [3-5].

BREEAM Communities is an independent, third party assessment and certification standard based on the established BREEAM methodology. It is a framework for considering the issues and opportunities that affect sustainability at the earliest stage of the design process for a development. The scheme addresses key environmental, social and economic sustainability objectives that have an impact on large-scale development projects, including of former industrial areas.

BRE recognises that the selection of an appropriate site for development is a critical factor in determining how sustainable a new community will be. In the UK, the process of selecting sites for development is largely determined by local planning authorities, developers and landowners. BREEAM Communities scheme covers the assessment and certification of the designs and plans for new development and regeneration projects at the neighbourhood scale or larger, to influence decisions that will have a fundamental impact on sustainability.

There are three steps involved in the assessment of sustainability at the masterplanning level:

1. Following site selection there is a process whereby the developer must show the suitability and need for specific types of development on the site as part of a planning application. Strategic plans for the wider area, usually contained within the local authority's planning policy documents, should indicate the housing, employment or services that are required. The new development will need to respond to these local requirements in order to receive planning permission. In this scheme the process described above is assessed under Step 1: Establishing the principle of development. During this step, the BREEAM Communities framework emphasises the opportunities to improve sustainability at the site-wide level, such as community-scale energy generation, transport and amenity requirements. All issues within this step contain a mandatory element reflecting what should be considered standard practice for developments which aspire to high sustainability standards.

2. The next step, Step 2: Determining the layout of the development includes detailed requirements regarding how people will move around and through the site and where buildings and amenities will be situated.

3. The final step, Step 3: Designing the details involves more detailed design of the development including: the design and specification of landscaping, sustainable drainage solutions, transport facilities and the more detailed design of the built environment (but excluding detailed building design) [5].

3 Methodology

The issues within BREEAM Communities scheme grouped into five assessment categories which are considered through appropriate criteria in Steps 1 to 3 described above. It is difficult to categorise sustainability issues definitively, as they often affect all three dimensions of sustainability (social, environmental and economic). By assigning categories, BREEAM seeks to provide some clarity about the intention of each issue. A sixth category promotes the adoption and dissemination of innovative solutions. The categories are listed below with a brief description of their overall aims:

- Governance - Promotes community involvement in decisions affecting the design, construction, operation and long-term stewardship of the development.
- Social and economic wellbeing - Considers societal and economic factors affecting health and wellbeing such as inclusive design, cohesion, adequate housing and access to employment.

- Resources and energy - Addresses the sustainable use of natural resources and the reduction of carbon emissions.
- Land use and ecology - Encourages sustainable land use and ecological enhancement
- Transport and movement - Addresses the design and provision of transport and movement infrastructure to encourage the use of sustainable modes of transport.
- Innovation - Recognises and promotes the adoption of innovative solutions within the overall rating where these are likely to result in environmental, social and/or economic benefit in a way which is not recognised elsewhere in the scheme.

The aim of the categories is an important aspect of the BREEAM Communities weighting system. Category weightings were developed by determining the impact of each category against each of the three pillars of sustainability: social, economic and environmental [5].

4 Result and discussion

In Moscow, it is quite difficult to find free land for planning areas with developed recreational infrastructure in accordance with BREEAM Communities scheme. It is most expedient to take into account various options for ensuring the ecological safety of construction in the system of urban cadastral estimates [4]. Land in the city has a high cadastral value and limited area.

According to the above methodology, the following types of real estate are included in the housing stock:

- individual houses, parts of these houses, as well as rooms in an individual residential building;
- flats, parts thereof, as well as rooms;
- all the above objects that are under construction (unfinished construction).

The cadastral value of the Oxides of housing stock is determined in the following sequence by [6]:

1. List of objects of housing stock for an assessment is formed.
2. Information about the residential real estate market for the estimated objects is analyzed, the criteria for choosing a statistical model of cadastral value estimation are substantiated.
3. Pricing factors of the objects of evaluation are determined.
4. Data on the values of pricing factors are collected.
5. Assessment objects are grouped.
6. Market information collected.
7. Statistical model of estimation is constructed.
8. Quality of the selected statistical evaluation model is analyzed.
9. Calculates the cadastral value of objects of evaluation.
10. Evaluation report is prepared.

In General, the sequence of cadastral evaluation of capital construction projects related to the housing stock is similar to the sequence of actions during the cadastral evaluation of land plots (Table 1).

Table 1. The average level of cadastral value of land plots by types of permitted use in Moscow at the end of 2018 (calculated in accordance with [7])

No.	The name of the permitted use	Average cadastral value of 1 square meter of land, RUB.
1.	Land plots intended for placement of houses mid-rise and high-rise residential development	14 936,20
2.	Land plots designed to accommodate low-rise residential buildings, including individual residential buildings	11 670,61
3.	Land plots intended for Parking lots and garages	13 227,49
5.	Land plots intended for placement of objects of trade, public catering and consumer services	14 718,03
6.	Land plots intended for hotel accommodation	16 754,36
7.	Land plots intended for business and commercial office buildings	14 918,35
8.	Land plots intended for placement of recreational and health-improving facilities	11 837,27
9.	Land plots intended for the placement of industrial and administrative buildings, structures, industrial facilities, utilities, logistics, food supply, sales and procurement	11 372,17

An excellent solution for the planning of such large-scale developments will be the use of former industrial land. Their cadastral value is the lowest in the land market and the area is tens of hectares. Construction on such areas of new modern areas is beneficial for both the developer and the city. In this case, it is ideally possible to show the use of "green" technologies and standards, firstly in order to improve the environmental situation of the areas, the creation of reactionary zones, and secondly, on the example of large-scale development, it is possible to identify, systematize and edit the regulatory inconsistencies associated with the application of European standards on the territory of Russia.

In the structure of the developing modern city in recent years, the problem of renovation of industrial areas is particularly relevant. The term renovation refers to the adaptive use of buildings, structures, complexes when changing their functional purpose.

Industrial enterprises of cities occupy a significant place in the formation of the urban system. In the historical context, many cities were formed around the factories, which were the dominant and starting point in the formation of the city, and the residential areas were later inhabited by the "industrial core".

With the development of science-intensive and innovative production, the city is gradually turning into an administrative and business center, and, accordingly, the semantic dominants of cities are administrative and office blocks, there are high-rise buildings And other previously dominant industrial zones are dissolved and suppressed by modern buildings. Technologies become obsolete, many enterprises stop their work because of the inefficiency of production and, as a result, are gaps in the urban planning system of modern

cities. Today, many industrial facilities are cut off from the urban social environment. All this has the character of "isolation" of objects of industrial heritage in the modern city. There is a natural problem: the need to adapt industrial zones of cities to modern conditions.

The problem is the integration, the inclusion of "lost" industrial areas in the urban environment. This process is called renovation (update), although used and such terms as reconstruction, rehabilitation, etc.

What new functions can industrial buildings and territories perform? Are they doomed to isolation from the city? Do they retain the status of protected areas (gated community), even after transformation into residential or business complexes? Or can they become a full-fledged part of the city? Is it possible to create urban fabric with a simultaneous architectural effort or is it a matter of a long time? It should be borne in mind that the process of renovation is very expensive, as a rule, it is more expensive than new construction, as it includes the withdrawal of the enterprise and the sanitation of the contaminated area. As a rule, the way out of the situation is in the public-private partnership. Therefore, such complexes include a commercial component (expensive housing, trade or offices), and only in exceptional cases the city budget can afford a non-profitable project (Fig. 1).

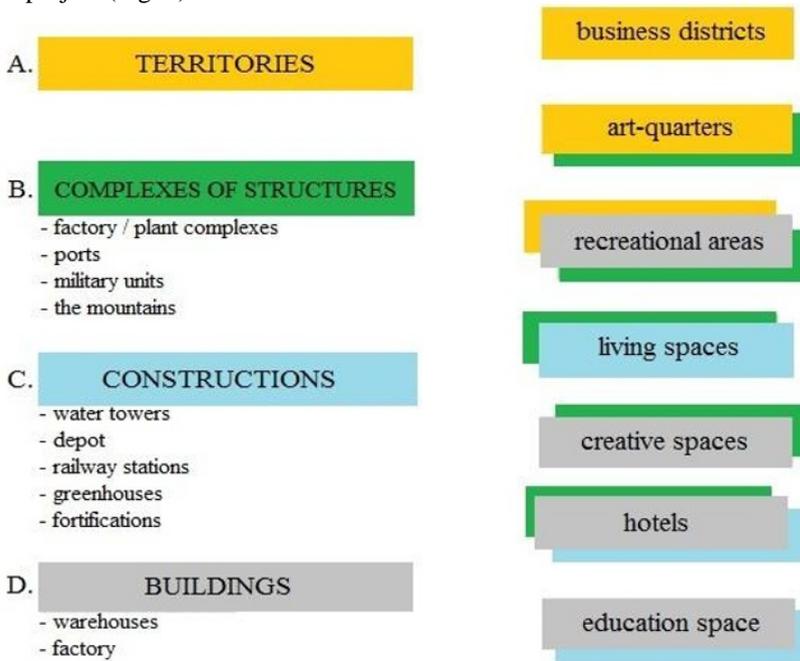


Fig. 1. Division into types of reconstructed objects and their inherent functions after reconstruction.

In London the Kings Cross is one of the largest renovation projects of the former industrial zone in Europe. The area of the district is a little more than 27 hectares. Previously, it was an empty industrial area, but now there are building new homes, shops, offices, bars, restaurants, schools and even a University in Moscow is a stretch can be compared to the Kursk railway station, next to which were the Winery and "ARMA". They were also converted into an office block and a center of contemporary art. But the problem is that the Winery and "ARMA" - single projects, and in London we are talking about the renovation of a huge area.

Five Pancras Square will have 14 floors in total, including the basement, providing two public swimming pools, a leisure centre, library facilities and a café. There will also be a

customer service centre to help residents to get easy access to all the services they need, along with Council office accommodation (Fig. 2).

It is a planning policy that the project achieves an ‘Excellent’ BREEAM rating [8]. However, Camden Council, King’s Cross Central General Partner Ltd and the project team all aspired to target an ‘Outstanding’ BREEAM rating from the outset of the conceptual design and when establishing the brief.

- BREEAM rating: ‘Outstanding’
- Score: 97.6%
- Size: 22,214m² (GIA)
- Stage: Post-Construction
- BREEAM version: Bespoke BREEAM 2008



Fig. 2. Five Pancras Square, King’s Cross, London.

Almost all the space is given to pedestrians and cyclists. Roads for cars are hidden as much as possible. This is a completely new type of urban space: when you walk here, you just do not notice the cars. They’re somewhere far away, going along the back facades of buildings. And yes, there is no open Parking at all – only underground (Fig. 3).

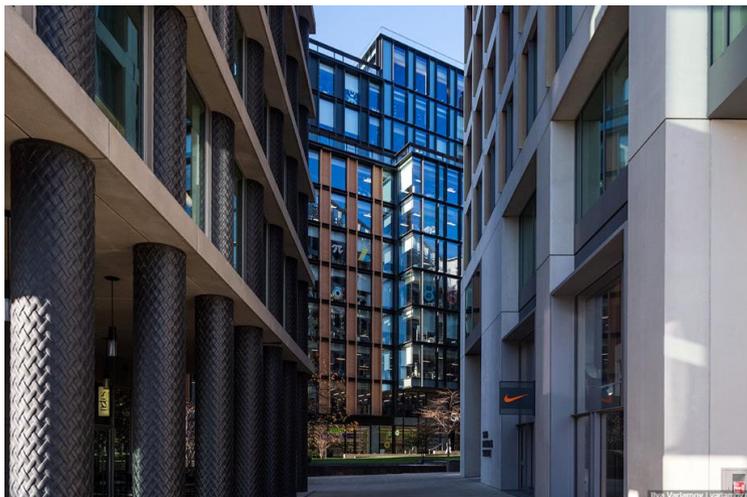


Fig. 3. King's Cross office buildings, London.

The history of BREEAM has already fifteen years of experience, but in Russia units of buildings are built according to this standard.

To date, legislative incentives to maximize the implementation of BREEAM Community in Russia can be [9]:

1. Compulsory measures:

- establishment of authorities in our country to control the implementation of energy efficiency requirements by developers;
- expansion of the energy audit system of new or reconstructed buildings;
- fixation of the primary version of the energy certificate at the design stage before obtaining a construction permit;
- assigning energy-saving classes to buildings that increase their competitiveness in the real estate market;

2. Incentive measures:

- extended subsidy mechanism;
- provision of material assistance for the purchase of energy-saving equipment;
- issuance of annual quotas for electricity generated from renewable sources;
- receive subsidies for energy audits of buildings and related equipment;
- preferential rates for energy;
- interest-free mortgages or interest-free loans to upgrade thermal insulation systems;
- introduction of energy-efficient technologies in buildings by the procedure of granting loans;
- presentation of tax benefits, payment of certification costs, reduction of payments upon obtaining a construction permit, loan system, grants;

3. Information measure:

- development of a system of continuous environmental education covering all structures of society;
- introduction of training programs in schools and other educational institutions.
- comprehensive notification of housing owners by housing and communal services employees about the benefits of using "green" technologies;
- implementation of green advertising campaigns.

To solve the problems of certification of "green" buildings in Russia [10], it is necessary to form a new approach to training specialists and the formation of an accessible system of eco-assessment of buildings for architects [11].

In the future study of the industrial zone on example of "Ostashkovskoe highway" it is planned a detailed analysis of the shortcomings of the regulatory framework and simplify the renovation of objects on BREEAM Community for the Russian Federation.

5 Conclusions

The requirements of BREEAM Community as a whole can be considered exhaustive and cover all impacts of building throughout their life cycle. Also BREEAM includes "Green Guide Calculator" is a convenient tool that allows you to compare available production technologies and types of building by the criteria of environmental safety, and to distinguish among them the best. The rating system clearly shows the impact of building and former industrial areas on the environment, builders and building owners.

Some disadvantage of BREEAM can be considered a complicated and cumbersome system for calculating the points received based on the rating of various issues. But in general, it justifies itself, because most fully and adequately reflects the ecological safety of building and its specific gravity in the environmental safety of the entire building and adjacent territory.

This work was financially supported by Ministry of Science and Higher Education of the Russian Federation (#NSh-3492.2018.8).

References

1. V. Telichenko, A. Benuzh. Selection of the most appropriate and energy-efficient scheme for Russia between BREEAM and LEED // *Advanced Materials Research*, Chapter 15: Energy Efficiency and Applications, Ecological and Energy Saving Building, Lighting. (2014). pp. 2169-2172.
2. Valery Telichenko, Gavin Dunn, Andrey Benuzh. The process of adaptation «green» standards BREEAM international in Russia and role of participants. *MATEC Web of Conferences* 193, 05001 (2018).
3. Springer International Publishing, (2014), 162 pp., ISBN: 978-3-319-11046-2, 978-3-319-11047-9.
4. M. Slesarev. Formation of systems of ecological safety of construction: monograph / M.Y. Slesarev; M-in Education and Science of the Russian Federation, FGBOU VPO "MSSU". - Moscow: MGSU. (2012). 352 p.
5. BREEAM Communities Technical Manual SD202 - 1.2: (2012).
6. Introduction to Homeland Security, Second Edition — Butterworth-Heinemann, (2017). — 1042 p. — ISBN 978-0-12-810433-0.
7. The law of the Russian Federation from 11.10.1991 N 1738-1 (as amended on 26.06.2007) "On payment for land" Section VII. Standard land price.
8. D. Doan, A. Ghaffarianhoseini, N. Naismith, T. Zhang, J. Tookey. A critical comparison of green building rating systems building and environment. (2017). **T. 123**. pp. 243-260.
9. E. Suhinina. Environmental standards in architectural and urban design: dis. kand. sciences'. Saratov, (2014). 165 p.
10. T. Meshcheryakova Problems of the development of international standards of "green building" in Russia. In the collection: IOP Conference Series: Earth and Environmental Science **19**. Ser. "Energy Management of Municipal Transportation Facilities and Transport, EMMFT 2017". (2017). p. 012118.
11. V. Telichenko, V. Roitman, A. Benuzh. Complex safety in construction: tutorial // UNIVERSITY. (2015). 144 p.