Energy efficiency in the development of landscape space

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Abstract. The topicality of the subject stems from a lack of energy resources and dependence of many countries, including the countries of the European Union, on energy imports and the need of the limitation of climate changes. With the introduction of energy efficiency measures, the economic situation of the countries improves, environmental pollution reduces. Consequently, when drawing up development plans at various levels – the regional, national, local levels, a major focus is laid on energy efficiency. In the strategy of the European Union's sustainable development "Europe 2020", increasing of energy efficiency has been approved as one of its fundamental objectives, which includes saving 20 % of the EU primary energy consumption up to 2020, compared to the forecast. With the introduction of energy efficiency measures for the development of local governments, transformation of the landscape occurs, which is reflected in the aesthetic quality of the landscape space and it puts focus on the aspects of the development of the local territorial planning.

Keywords: rural and urban landscape space, energy efficiency.

Introduction

The Latvian authorities pay great attention to sustainable development, which depends on the state of the economic, ecological and social environment, which is linked to the energy efficiency indicators. Within this framework, energy efficiency measures are viewed that visually affect both the rural landscape space and the urban environment.

The study involves several measures of energy efficiency:

- the production of renewable energy, using solar panels and collectors, wind generators and bio-energy plants;
- saving, organizing the urban infrastructure, improving energy efficiency in buildings and switching to LED lighting;
- activation of the existing resources, by introducing rainwater collection systems in the cities for further use in the household and waste sorting and recycling.

The aim of the study: to evaluate the types of energy efficiency measures, the opportunities of their utilization in the development of the urban or rural landscape space.

A number of *assignments* are moved forward:

- Study the world examples that successfully implement energy efficiency measures for the development of local governments.
- Evaluate the impact of the energy efficiency technology, equipment, measures on the urban space from the visual aspect of the landscape.

The *hypothesis* of the study - the utilization of energy efficiency measures in the local planning, so improving the urban (rural environment) visual design and sustainable development of the territory.

Materials and Methods

The study is based on using several methods:

- the analysis of the scientific literature and the implemented projects;
- the study and analysis of the international legislation and legislation of the Republic of Latvia in force;
- survey in nature, photo fixation, evaluation of viewing lines, silhouettes;
- the study and analysis of foreign experience.

The study of energy efficiency includes a number of cross-industry trends – engineering-technological solutions in construction, territorial planning, environmental management and the evaluation of landscape space to find successful solutions for sustainable planning in regionally different local governments.

Discussion

According to the definition, energy efficiency is efficient utilization of energy and it has an important role in the modern trend of the industrial development to decrease the likelihood of natural disasters. The aim of energy efficiency is to lower consumption of non-renewable and partly renewable resources and improve environmental quality.

In the past 10 years, primary energy consumption is increasing yearly, on average by 2.6 %, in 2012 it accounted for 1.8 %, indicating a slowdown in growth [1]. Throughout the world, significant attention is paid to energy consumption and the reduction of its negative consequences. Various types of energy generation and consumption have an impact on the environment and ecology. For instance, energy generated from renewable natural resources, such as the sun and the wind, is more environmentally friendly than that from fossil fuels.

Throughout the world, in different regions and at all levels - the international, regional, national, municipal, sustainable development strategies, directives, regulations, legislation are being developed, which largely focus on energy efficiency:

Development strategy "Europe 2020" which aims to promote growth and employment in the EU as a whole and for each Member State separately. For the strategy "Europe 2020"– one of the key objectives is to increase energy efficiency to 20 % by 2020 in the European Union [2];

Each European country has drawn up its "National Renewable Energy Action Plan", which sets concrete goals and tools for their achieving in the sphere of generation of renewable energy [3];

Directive 2011 "*Energy Performance of Buildings"* requests for 2020 to achieve near-zero energy consumption for all new and rebuilt buildings [4].

In the field of efficiency, the above documents are primarily based on two objectives:

- the increase in energy generation from renewable resources;
- energy saving measures.

In 2012, in Europe and Asia, consumption of energy from renewable resources, excluding hydropower, totals to 4.7 %, and this result is increasing rapidly each year [1].

In designing sustainable development plans, local governments stop at the principle that three dimensions must be balanced: the economy, ecology and social environment (Fig. 1) [5].

The balance of the economy, ecology and social environment is basis for sustainability, but there is still one important dimension - aesthetics. A healthy ecological state of the environment is clearly aesthetically high, thanks to the biological diversity, the environmental cleanliness and the health of plants. Following on from that, the three-dimensional scheme can be extended up to four dimensions, creating balance and harmony.

It is impossible to create a universal sustainable development plan for a local territory, because each of them has a unique geographical location, the climatic conditions, the economic situation, the size of the territory, the number of population and cultural environment.

When planning the landscape space, it is important to ensure the comfort of the development of the society: without using the road transport to faster get to the office, school, sport complex, etc., reducing environmental pollution and leaving a positive impact on the human health. These requirements are generally easy to get for small, compact cities. If the city is characterized by the development of the centre, then the population density increases, property prices are rising and this contributes to the building of a suburban area.

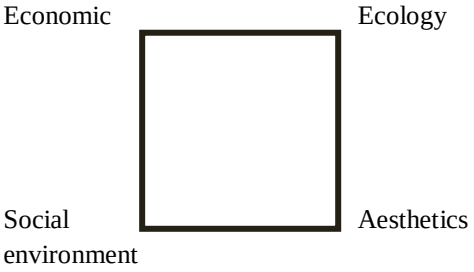

Fig. 1. A four-dimensional model of a successful development of the local government [Source: construction by author, 2013].

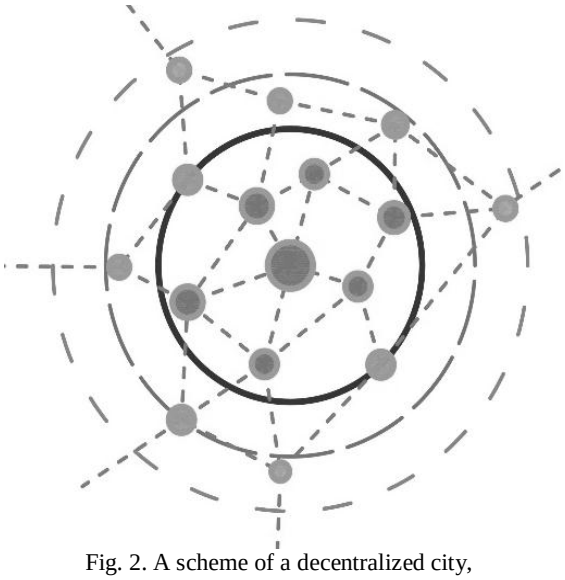

Fig. 2. A scheme of a decentralized city, with small centers in the city, in the suburbs and in the rural area, connected by green corridors [Source: construction by author, 2014].

The subsidiarity or a new building of the satellite type, in a high degree of comfort must ensure citizens with the necessary distance of institutions from the place of residence and with sound infrastructure, with green corridors between them, which positively affect the urban microclimate [6].

Cities should aspire to independence: the generated energy must exceed consumption of energy; production must be developed and it should be moved to non-waste production, which minimizes the ecological footprint.

A sustainable development of the local government requires the support of several resource types: physical, social, economic, biological, organizational, cultural, historical and aesthetic resources. The city's sustainable development requires a comprehensive and diversified development [5].

A new approach to urban planning includes seven categories:

- *Strategic territorial planning area.* Its essence is to choose the direction of the local government/city development, define the goals and principles of the development that would ensure balance in all four dimensions.

- *Integrated spatial planning.* The goal is to replace the traditional territorial planning and spatial planning. It is based on the principle of subsidiarity and the desire to integrate public outdoor space functions with the individual, user needs.
- *Control and management of the land.* Based on an informal approach to spatial planning.
- *Process for participation and partnership.* Based on the public participation in the planning process.
- *The solution of the problem of the city's industries with an approach and experience of an international agency.* Directed to the solution of important problems of the urban environment through the experience of other cities and cooperation with other cities in problem solving.
- *New forms of general planning.* Based on the existing urban replanning and democratic solution to the problem.
- *Planning with the objective of creating new spatial shapes.* Based on the creation of a friendly environment with mixed functions, spacious public areas, pedestrian-friendly infrastructure [7].

Energy efficiency measures have an impact on four dimensions of a successful and sustainable development of the local government:

- economy - new jobs in the energy sector, the population survival charge reduces, local governments become less dependent on energy imports, and, if the development is successful, may even export energy;
- ecology – consumption of non-renewable resources and environmental pollution are reduced, which results in improving the urban microclimate;
- social environment – with new jobs and decreasing of the costs of living, the standard of living of the inhabitants increases, which positively affects the comfort of the local population;
- aesthetic – energy efficiency measures affect the visual image of the municipality and the city. The scale of the impact is varied, starting with the landscape space of a single yard and finally to the city scale. Energy efficiency measures tend to transform the city's skyline and the type of the landscape. It would be feasible if the degree of impact of each individual measure of energy efficiency is studied and proposals for their implementation are developed.

One of the indicators of the aesthetic and economic quality of the urban space is installation of *LED lighting.* The design of light fixtures, artificial light intensity and illumination angle – in the evening hours accent the character and silhouette of the building, giving a romantic mood to the urban space. It is one of the compositional techniques, which visually enriches the city's expression. With the development of LED decoration technology, in winter conditions it is possible to dress the tree branches in light garlands, making up the urban environment in a new form of expression.

By fitting the lights in the façades of buildings, the architectural expressiveness of the building is intensified. In turn, during the daytime, the placement of lighting fixtures is not noticeable, but their design, shape and coloring are readable.

One of the most important ecological indicators of the urban space is the increase of the number of *bike paths* and the removal of heavy road transport load from the building of the city's central part. As a model for the development of bicycle transport in Latvian cities serve the cities in Scandinavia: Copenhagen and Malmö, where the climate is similar to Latvia. In Copenhagen, 37 % of the employees and students in the city use bicycle transport on a daily basis, so creating a new structure of the urban space.

Fig. 3. LED decorations on boulevard J. Čakste in Jelgava [Source: photo by author, 2013].

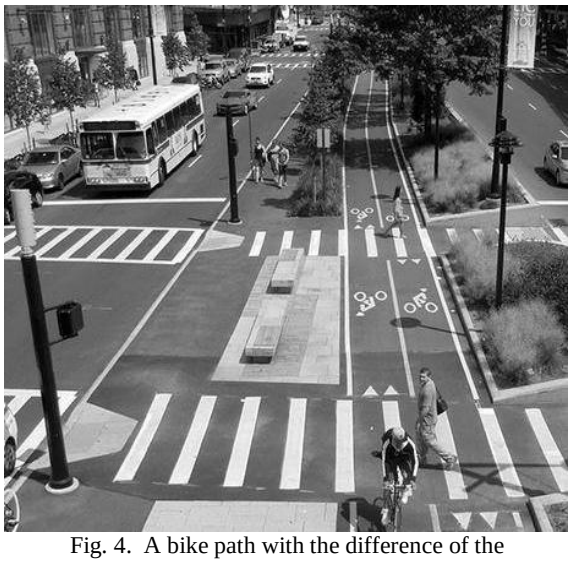

Fig. 4. A bike path with the difference of the carriageway, bike path and sidewalk levels in Copenhagen [Source: photo by author, 2013].

Fig. 5. The red color of a bike path. Jūrmala [Source: photo by author, 2013].

Fig. 6. The green roof is visible within the distance of 500 meters in Stockholm [Source: photo by author, 2012].

The carriageway, bike path, sidewalk – this type of road structure is applied in narrow city building sites that do not have the opportunity to create a green buffer zone.

For safety, the level difference is created between all the three motion belts.

Separation of the carriageway from the bike path and pavement by a green plantation zone. Such a structure is safer, protects cyclists and pedestrians from the road transport. Visually, it is more varied and enjoyable, and it narrows part of the carriageway and extends the comfort zone for pedestrians. The buffer zone is not created only by green plantings, but also by the additional function - parking lots. For preservation of the visual effect, it is important not to turn the buffer zone only into a parking lot, but it has to harmoniously merge with the green plantings.

The carriageway and bike path are separated from the sidewalk by a green buffer zone. This street structure is maximum safe for pedestrians. Visually, it makes the road passage wider, narrowing the safe pedestrian part of the street. In turn, from the ecological point of view, cyclists must be in the zone of the flue gas corridor. Therefore, in the urban space, special attention should be paid to the possibility of creating the green planting belts densely along the transportation zone.

The transport, cyclist and pedestrian movement belts are separated by the green planting. This structure is applicable to new housing estates, forming a type of Mežaparks /Forest Park/ building, consequently, it is rare. In turn, you get safety and ecology both for cyclists and pedestrians. Visually, it is diverse and more natural than the aforementioned cross-profile structures of the street.

In the territories of the largest Latvian local governments, the development of the bicycle transport areas is becoming more and more intense. It is brightly visible in Riga, Jurmala, Olaine, Jelgava, Liepaja, Daugavpils.

For the city of Riga, which is named a European Capital of Culture this year, the Bicycle Transport Development Program is developed, the purpose of which is to include the bicycle transport in the joint Riga transport system as a sustainable, equivalent with other means of transport, reliable and environmentally friendly means of transport [8]. Gradually, in Riga bicycle transport is becoming more and more popular, and the city becomes increasingly friendly with bicycle transport, and it is suitable for use of bicycle transport, thanks to the small size of the city, since most residential areas are within 10 km in radius from the centre, which is easily doable distance by bicycle.

The creation of the bike path network in the cities of Latvia is unambiguously a measure of energy efficiency due to a reduction in the use of the road transport that is not only an energy-saving measure, but also environmentally friendly. Unfortunately, in the Latvian climatic and natural conditions, bicycle transport is extensively used only for six months – during the summer time.

The aesthetic expression of the bike path and the bicycle parking lot is determined by the structure of the pavement cover, color, separation with green plantings, tree rows and by individual rest areas for the cyclers. Coloring, structure, rhythmic composition or individual form creation game are the main elements that enrich not only the cyclists' zone, but also the urban (rural environment's) landscape space.

In the urban planning, it is particularly important to get a network of bike paths, which run through the city's green plantings. In other words, the section of the buffer planting zone must be looked for in the transport intensity zones.

The main criterion for the rating of *energy efficiency* of *buildings* is heat and electricity consumption per m^2 of the building/year. In Scandinavia and the northeast of Europe, including the Baltic countries, an energy efficient building consumes 30–35 kWh/m^2/year. But due to the seasonal variation and temperature fluctuation, this indicator is difficult to achieve [9].

The energy efficiency of buildings is divided into three categories:

- increasing of the energy efficiency level of the existing buildings in the reconstruction process;
- construction of new energy efficient buildings;
- green roof installation.

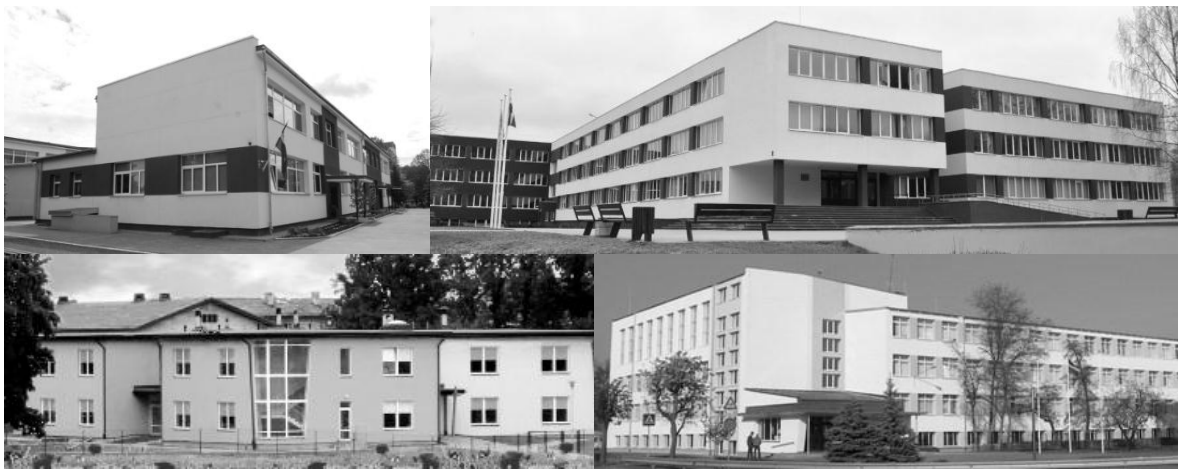

Fig. 7. Insulated buildings in Olaine with finishing in different colors [Source: from the Olaines municipality webpage: http://www.olaine.lv/izglitiba].

Fig. 8. "The Sun Stone" as a vertical accent, Riga [Source: from the Panoramio webpage: http://www.panoramio.com/photo/13277254].

Fig. 9. "Citadele", Riga [Source: from the *Arčers webpage:* http://www.arcers.lv/lv/aktualitates/get/nid/66].

Fig. 10. A plant container on Thomson Terrace, in Riga [Source: photo by author, 2010].

Fig. 11. A wide view of the landscape of Riga from Thomson Terrace [Source: photo by author, 2010].

Fig. 12. Wind generators in the Grobiņas parish in the distance of 1.5 km visually transform the landscape [Source: photo by author, 2013].

The measures of reconstruction of buildings improve both the indicators of energy efficiency and the visual appearance of the buildings - coloring, glazing, roofing material, etc. As technology evolves, energy efficiency is obtained by using the facade glazing, which enriches the urban expressiveness. This is attributable not only to public buildings, but also to high-rise residential buildings. Thanks to the transparency and reflection effect, glazing brings elegance, laconism and diversity of forms in the building, without competing with the historic building, but rather reflecting it. Very effectively it is also applicable to urban plantings, visually making the city greener with trees and lawn areas.

In the city space with a dense building, the *Green roofs* acquire greater importance**,** which positively affects the urban microclimate and the quality of life of the building, with plants producing oxygen and purifying the air. Increasing the density of the building, large green areas of cities are raised at roof level of the buildings.

Unfortunately, the intensive building increasingly pushed out the tree line, alleys or plantation groups, which are particularly expressive in different times of the year (the flowering chestnut trees and rhododendrons in spring, the colors of maple foliage in autumn, etc.). Thus, in the urban planning, it is important to strike a balance between building density, the place of tree-shrub plantings, lawn areas. Green roofs have a regulatory effect of both moisture and sound blocking, reducing the environmental noise. Functionally, the green roofs serve as recreational and vegetable growing areas, psychologically positively affecting the human health and well-being. Due to the climatic conditions and high costs, the green roofs in Latvia are not common, but several of the implemented projects are very popular, such as Thomson Terrace, White Wind, Gallery Riga in Riga, new elite apartment buildings in Jurmala and Riga.

In the view lines up to 100 m, the green roofs create the expressiveness of the silhouette of the street or an individual block of houses.

The renewable energy or energy from renewable resources is energy from sources that in modern society are inexhaustible, such as solar radiation energy, the wind, water, geothermal energy and biomass.

In 2011, in the world, from all the energy consumption, 78.2 % accounted for fossil fuels, 2.8 % for nuclear power and 19 % for renewable energy. In Latvia, based on data from 2013, 49.4 % electricity is generated in hydropower stations, 48.6 % in cogeneration stations. The remaining 2 % is due to the energy generated by the wind farms [10].

Generation and utilization of the renewable energy affect all the four dimensions of a sustainable local government building. In 2012, *wind energy* potential in the world formed 2.6 – 3 % of the global electricity consumption. During the same period, the European Union was able to generate as much wind energy to provide 7 % of all the electricity consumed in the European countries. Wind energy is the most widely utilized form of renewable energy – 59 %, not including hydropower. In Latvia, at the end of the year 2013, wind energy totaled to 2 % of all the energy produced in Latvia. The highest wind speed is in the western coast of the Baltic Sea and the Gulf of Riga, in its northern part. The impact of the wind generators on the landscape is a very important aspect in the process of energy efficient city planning [1].

The scale of the effect of the wind generator depends on the *visibility* of the objects and *the area to be occupied.*

Medium-size and large wind generators already 8 km away are highly visible, but they have a minimum influence on the landscape. They are part of the panorama, converging on a common background and not expressive. In the view line, which is less than 2 km, wind generators dominate in the landscape, they are perceived as large scale objects, and they transform the landscape.

The low power wind generators have a medium level of visibility. In the view line with a length of 4 km they are converging on a common background and visually do not have an impact on the landscape. Low power wind generators are used for power supply of separate units. Following on from that, it may be concluded that *the scale of the impact of low power wind farms on the landscape has a visually more lenient effect on the landscape space and it does not modify the overall visual image of the city.* They are usually found in areas of private houses and with the spread of low power wind generators, groups of generators will be formed in such areas and the impact on the landscape will be increased.

Visibility of large and medium-sized wind generators due to the height is reduced, thanks to the white or light gray color, and interpenetrating with the heaven. This type of wind generators is placed in groups, so creating wind parks. *Due to the large areas and the spectacular scale, they leave an impression of the visual quality on the common image of the urban or rural landscape space and the city skyline.* With the evaluation of the aesthetic quality of wind generators on the landscape, a number of landscapes with different types of wind generators are surveyed and analyzed:

The wind generator park in Copenhagen – the sea high power wind generators are located in the city, close to the beach.

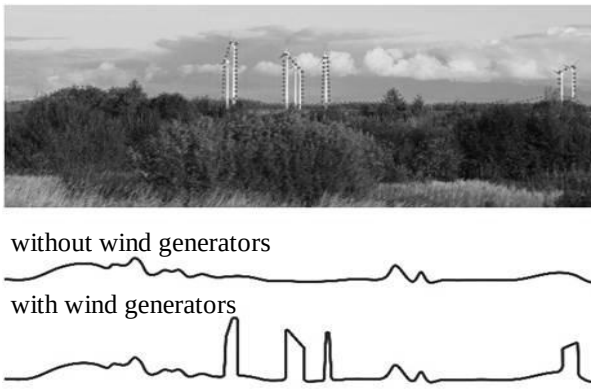

Fig. 13. Landscape silhouettes without and with wind generators [Source: photo by author, 2013].

Fig. 14. In the industrial zone, wind generators do not stand out, the scenery is harmonious [Source: photo by author, 2013].

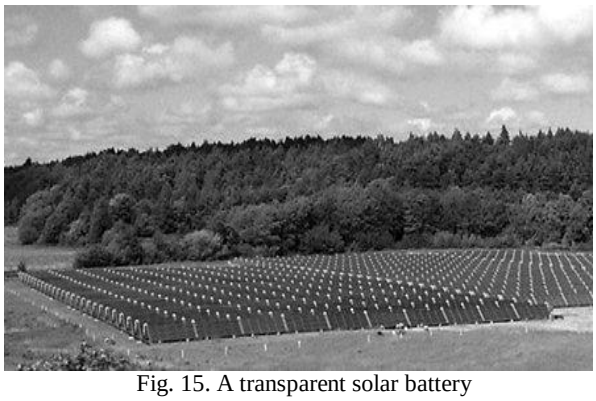

Fig. 15. A transparent solar battery [Source: from the Nijs J., Belgium: Photovoltaic NV. 113 p.].

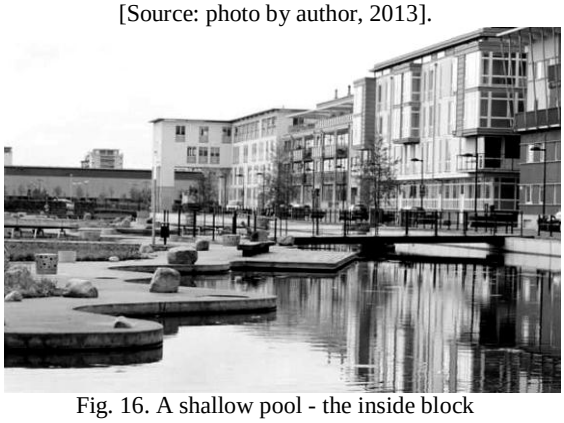

Fig. 16. A shallow pool - the inside block of residential houses, Malmö, Sweden [Source: photo from K. Siļķe private archive].

Fig. 17. A concreted pool with aquatic plants accumulates rain water during the rain, Malmö, Sweden [Source: photo from K. Siļķe private archive].

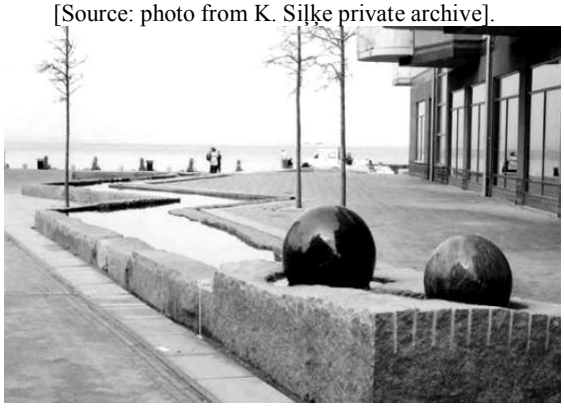

Fig. 18. An open watercourse, Malmö [Source: photo from K. Siļķe private archive].

Fig. 19. An artificial pond installation in Copenhagen [Source: photo by author, 2013].

A medium-sized wind generator park in Grobiņas parish, near the city of Liepaja;

Wind generators diversify landscape, medium-sized and large wind generators bring the character of an industrial area in the landscape. In the narrow and limited landscape space, due to the expressed dominance of the wind generators, the landscape tends to become disharmonious and unsafe. Being located in the industrial zone, wind generators merge with the character of the production buildings, creating an industrially laconic landscape. The location of a low power wind generator at the farmhouse creates a view line with an expressed dominant.

The sun is the largest source of the renewable energy. In 2012, the solar energy consumption accounted for less than 1 % of all types of energy consumption. The utilization of the world solar energy reaches the threshold of 5%: in Italy – 5.6 % and in Germany 5 %. In the last 5 years, the utilization of the solar energy is growing rapidly: in 2009, the solar energy potential is 24 GW, but in 2012 – already 102.5 GW, forming 21.3 % of the renewable energy, excluding hydropower [1].

But in the European countries, this figure is 33 %. In Latvia, the annual average solar radiation on the horizontal plate creates 1100 kWh/m^2 , but 60 % of those are eligible for the summer months. During the winter period, the generation of energy from the solar radiation is ineffective, but in the summer period by positioning a storage device, energy can be saved [1].

Due to the low efficiency and high costs, in the territory of Latvia solar batteries are not appropriate for utilization. The most suitable area for utilization of the solar energy is the coast of Baltic Sea, where the sunshine duration is 1900 hours per year, in the district of Riga – 1800 hours, but in the rest of the territory of Latvia only 1700 hours per year. Consequently, the visual impact of the solar collectors on the landscape space does not exist in urban or rural settlements. When placing the solar collectors and the batteries, the shadow should not be allowed to fall on them [11].

It is applicable for tree planting sites, which often prevent this technological equipment from normal functionality. This requires a careful balance of the green planting sites, the dendrology characteristics of trees, the architectural characteristics of buildings, the readability of the sky direction and the building silhouette in the main view lines.

Due to the relatively low sunshine index, the solar energy is typically used as a means of heat generation and only in a few cases as a means of electricity generation.

The solar panels and collectors for supplying separate units with electricity or heat are located in the areas of the suburban mansions, but due to the small height of the buildings the landscape is not changed. Today, they are found rarely, but with increasing requirements of energy efficiency, the landscape will become more uniform and the roofs of houses in the southern side will become alike. The solar panels and collectors frequently do not cover all roof surface and on various buildings they are located in different places, with different angles, which creates chaos and disharmony.

The utilization of *bio-energy* is very diverse, it is used in construction, industrial, heating and transport areas. The most significant benefit of bio-energy is that its incineration process does not affect climate changes. About a third of the electricity generated in Latvia is generated in cogeneration stations [12].

The areas of bio-energy stations are dependent on the volumes of the biomass processing. The area of a small station is approximately 3 ha, which is noticeable at the scale of a small city, but it is a factor of little influence. The buildings of bio-energy generation are usually colored in green, which reduces visibility and the degree of expression. In the open landscape, a bio-energy station clearly marks the production zone. The height of separate units may reach 10 m. The stations are located in the suburban or industrial zone of the city, and, in this case, the scale of impact is local. By locating the bio-energy generation station near major infrastructure units or marking it in the city's historic skyline among the church spires, the total visual image of the city is muffled. Vecauce Castle is one such unfortunate example and merging of the view lines of the biogas plant from the Lielauce road as well.

The location of bio-energy stations depends on several indicators: the economic, ecological and aesthetic ones. For bio-energy station to operate economically, it should be located:

Within a radius of less than 15 km from the available biomass resources;

The station should be located as close as possible to the place of consumption of the generated energy;

Not far from the main roads, economically more profitable is to locate near a road, but aesthetically it will have a negative impact on the landscape.

The activating measures of the existing resources include: rainwater collection and utilization; waste sorting and recycling.

In urban areas, there is the rain sewer infrastructure that collects rainwater and leads to treatment plants along with the utilized household water or to the closest water bodies, such as rivers.

Nowadays, the rain water systems are developing and they are upgraded. Rain water reservoirs are not just a water regulatory tool in the city landscape, but also a recreation element in populated areas.

There are several types of rainwater storage:

Artificial ponds - water from roads and rooftops of buildings is collected in the pool, overgrown with local plant species it is an attractive recreation element, in the content and form it is close to a pond and visually is perceived as a natural element. It is typically found in parks or residential backyards.

A pool with the ground cover – the rain water is collected in the pool from the road and rooftops of buildings. Rainwater pools are often shallow and they are installed in city squares, parks or residential neighborhoods. The pool shape and visual design can be very varied and depends on the designer view.

Open shallow watercourses – a shallow canal that collects rainwater and creates an open watercourse to the water reervoir, for instance, the pool, water collector or sewerage runoff point. Visually very diverse and attractive.

Overgrown ditches – along the streets with local moisture-loving plants. This system protects the streets from flooding, increases and varies the urban green area. All the water reservoirs collect water from a lower level, compared with the surrounding ground surfaces. In general, they create the rain water collection infrastructure that manifests itself in the city's area as the "blue finger", which allows you to save fresh water, increase the city's biological diversity, improve the city's microclimate and diversify the city's landscape.

Rain water reservoirs are built from small, narrow and clear creeks, almost invisible in the landscape, and, finally, with large ponds and pools or long watercourses, which are remarkable landscape-forming elements. If open watercourses are detected in the water reservoir, then the unit is dynamic, but if water penetrates into the substrate and the reservoir is overgrown, it is static and dynamism may be demonstrated only during in windy weather, through the moving of plants.

The collection of rain water in the water reservoirs affects the city's landscape, bringing more water elements, but it is varied. Water is a soothing element and a masterfully framed in the designer created pools, ponds, canals – harmonizes the landscape. If there is the level difference in the water reservoir that creates artificial cascades, it leads to a pleasant and soothing sound of falling water. If the water reservoirs are overgrown, they tend to cause specific, pleasant herbal scent.

Conclusion

The energy efficiency measures affect the city's visual aesthetic quality. The scale of the impact on the urban landscape, mainly, has to do with the visibility of an energy-efficient object. If the object is visible only in close proximity, the scale of the impact is local in nature (a bike path in the context of the landscape of the street). In turn, for the large-scale construction volumes (wind parks, CHP, etc.), the impact level is much more impressive.

The new residential blocks with energy-efficient buildings and green roofs, a developed road infrastructure with bike paths and rainwater collection systems in the backyard areas bring high visual aesthetic quality in the urban landscape space.

In turn, wind generators, solar collectors and biogas stations vary the landscape, but bring industrial shades in it, so their location must be carefully assessed. This is attributable to the municipal development plans for the territory, focusing on the preservation and improvement of the aesthetic quality of the environment. This question requires an interdisciplinary teamwork.

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Kopsavilkums. Tēmas aktualitāte izriet no energoresursu trūkuma un daudzu valstu, tajā skaitā Eiropas Savienības valstu, atkarības no enerģijas importa, kā arī no klimata pārmaiņu ierobežojuma nepieciešamības. Ieviešot energoefektivitātes pasākumus, uzlabojas valstu ekonomiskais stāvoklis, samazinās apkartējas vides piesārņojums. Līdz ar to sastādot attīstības plānus dažādos līmeņos – reģionālā, valsts, pašvaldības līmeņos, liela uzmanība vēsta energoefektivitātei. Eiropas Savienības ilgtspējīgas attīstības stratēģijā „Eiropa 2020" energoefektivitātes palielināšana ir apstiprināta kā viena no pamatmērķiem, kas ietver līdz 2020. gadam ietaupīt 20 % no ES primārās enerģijas patēriņa, salīdzinot to ar prognozēto. Ieviešot energoefektivitātes pasākumus pašvaldību attīstībā notiek ainavas transformācija, kas atspoguļojas ainavtelpas estētiskajā kvalitātē un tas liek vērst uzmanību uz pašvaldību teritorijas plānojuma izstrādes aspektiem.

Daudzi no energoefektivitātes pasākumiem ievērojami ietekmē ainavtelpu. Latvijas pašvaldības lielu uzmanību pievērš ilgtspējīgai attīstībai, kas ir atkarīgs no ekonomiska, ekoloģiska un sociālas vides stāvokļa, kas ir saistīts ar energoefektivitātes rādītājiem. Tā ietvaros tiek apskatīti energoefektivitātes pasākumi, kas vizuāli ietekmē gan lauku ainavtelpu, gan pilsētvidi. Pētījums ir saistīts ar vairākiem energoefektivitātes pasākumiem:

- atjaunojamas enerģijas ieguve, izmantojot saules baterijas un kolektorus, vēja ģeneratorus un bioenerģijas ražotnes;
- taupīšana, sakārtojot pilsētas infrastruktūru, uzlabojot ēku energoefektivitāti un pārejot uz LED apgaismojumu;
- esošo resursu aktivizēšana, ieviešot pilsētās lietus ūdens savākšanas sistēmas, turpmākai izmantošanai saimniecībā un atkritumu šķirošanu un pārstrādi.

Pētījuma mērķis: izvērtēt energoefektivitātes pasākumu veidus, to pielietojuma iespējas pilsētas vai lauku ainavtelpas attīstībā. Pētījumā apskatīti pašvaldību ilgtspējīgas attīstības pamatprincipi. Izpētīta Latvijas Republikas likumdošana energoefektivitātes jomā.