

BIOCLIMATIC URBAN DESIGN – GENERAL, ECOLOGICAL AND ECONOMIC ASPECT

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Abstract: The need for energy-efficient, bioclimatic and environmental, concept of architectural structures have caused on the one hand, a whole new scientific discipline called bioclimatic design, and on the other hand, it can be said that it is a return to the beginning or to home architecture. This paper analyzes the problem related to the general aspect of bioclimatic urban planning administered concurrently with a review of the two components and is compatible work, without which it cannot even talk about contemporary Bioclimatic urban planning and design. Specifically, these are the environmental and economic aspect, which in contemporary world and the present level of development of science and technological knowledge go together, that we cannot speak on economic approach to the problem and at the same time does not consider the impact of the observed phenomena in an ecological way, or on the environment.

Keywords: *bioclimatic design, urban planning, environmental economics, environmental tax*

INTRODUCTION

In the introduction to the subject matter of this paper, first we start from the current energy situation in which the modern world as well as the forecasts and estimates of future trends. Namely, in order to keep pace with the growing needs of the world's population, according to estimates of higher world energy consumption by 2050 will more than double. At the same time we will

almost entirely deplete the oil reserves. On the other hand, the alarming fact is that since 1965 CO₂ emissions have doubled. Even worrisome by having 442 active nuclear reactors produce 17% of electricity in the world, and it is known that nuclear energy, should be put under the control of man could not satisfy the needs of the population for electricity. In addition, even 25% or 1/4 of the world's energy is exploited for traffic. It is interesting the fact that each person per year on average consumed energy equal to the energy obtained from 1.5 tons (tones of oil equivalent - toe). In fact, however, there are significant differences among world regions: American 8 TEN / year; 4 European TEN / year; Ten Japanese 3 / year; Ten Indian 0.4 / year. In fact, every year, all the world's people consume as much energy as would be obtained by burning ten billion tons of coal! At present about 40% of the total energy comes only from oil and almost half comes from coal and natural gas. This makes a total of almost 90% of the energy consumption of humanity that comes from fossil fuels, which sup on the definition of exhaustion so the question is why mankind does not turn to the sources of energy that are regionally available renewable energy are in fact are completely free.

When we speak of Construction and Urban Planning, the building sector is responsible for 40% of total energy consumption in Europe. On the other hand, when the discussion turned economy with ecology, make sure to come up with sustainable development.

The term sustainable development of the first practical application of his had with the English forester, which meant permitted the felling of trees in relation to the increment annually. World Commission on Environment and Development in 1987 gave a generally accepted definition of sustainable development which is: Sustainable development is one that meets the needs of the present without jeopardizing future generations to meet their own needs. In connection with the foregoing discussion to introduce the bioclimatic architecture, it is contextual architecture, as will be discussed below.

1. GENERAL APPROACH BIOCLIMATIC PLANNING AND ARCHITECTURE

Bioclimatic architecture is the result of the concept of design and construction in which the object becomes an integral part of its natural environment. It is based on research of natural and created conditions for the location and their impact on quality of life. First of all, it is the design and construction of tread to provide quality microclimate conditions of the internal environment compared to the external, local environmental conditions.

The main objectives of bioclimatic architecture are:

1. Integration of the building with the environment and natural energy flows,

2. Use them to achieve higher comfort, without disturbing the natural ecological balance.

The terms that are closely associated with bioclimatic design and architecture are:

Ecological architecture - is an architecture which is more or less a part of the natural environment, which does not disturb the natural course of which using natural materials without causing any harmful effect on humans and the environment.

Green architecture - which has minimal negative effects on the environment and is maximally energy efficient.

Solar architecture - a name for the architecture that is designed to advantageously use direct solar energy to customers' needs: heating, cooling, ventilation.

Energy factors: energy efficient buildings are designed and constructed so that the rational power consuming. This is achieved by using new technologies, materials and methods of designing and exploitation. Energy-efficient buildings include integrated systems that include the building and technical-technological system that is in it.

2. FACTORS BIOCLIMATIC DESIGN

When we speak of about a factors bioclimatic design, then it is certainly the most important can be counted as follows:

- Climate changes,
- Global warming,
- Deficit of non-renewable energy sources,

- Population growth.

Definitions and parameters Climate: Climate is the average weather phenomenon characteristic or set of meteorological phenomena that characterize the intermediate state of the atmosphere in any place of the Earth's surface at some period of time, while the weather is really the state of meteorological elements and phenomena in a given moment.

Elements of climate can be classified into four groups:

- Cosmic elements: sunlight and sky,
- Telluric elements: of making the layer of the mantle (the lithosphere and the hydrosphere) and against radiation atmosphere, radioactivity, the content of dust and other particles in the atmosphere,
- Geological elements: the permeability of the Earth's mantle for solar and celestial radiation and its heat conductivity,
- Meteorological data: and jacket temperature of the air, air pressure, humidity, air and soil and evaporation, cloudiness and duration of sunshine, precipitation, snow cover, wind, electricity in the air.

Climate classification is determined by the criteria for classification. In architecture, the most significant are those parameters that determine the need for building heating and cooling, and have a decisive impact on the comfort of people. Those are:

- Solar radiation,
- Temperature and humidity,
- Precipitation,

- Wind.

How to comfort people and estimates expressed primarily through temperature and humidity, these are the two parameters used as the basis of classification of climate and architecture and urbanism. Accordingly, there are four main types of climate:

- Cold climate: lack of heat, and heat dissipation very largely year. The average temperature of the coldest month is -14°C . The annual minimum temperature may be below -50°C . They appear strong relative humidity during the winter.

- Mild climate: A lot of heat release during labor, and inadequate heat dissipation in the rest of the year, and there is a seasonal variation between overheating and insufficient heating, but none too harsh. The mean monthly temperature of the coldest month can be 15°C , and in the hottest months to 25°C . The extreme annual range may be from -30°C to 37°C . Temperatures of 20°C very rarely occur with a relative humidity higher than 80%. Rainfall is possible throughout the year, during the winter, often in the form of snow.

- The warm, dry climate: The basic problem is overheating, or inadequate heat dissipation from the surface of the body. As the air is dry, it is possible to evaporative cooling. Such air conditioning is characterized by high temperatures and high irradiation. The mean temperature of the hottest months is 25°C and relative humidity was small. Annual max. temperature is about 45°C , while the minimum and can be -15°C , as the design may be the basic element of consideration. The winds are strong, undisturbed vegetation, carry sand and dust.

▪ Warm, moist air: Overheating is accompanied by high relative humidity, limited ability to evaporative cooling. During the year, at least one month, has an average temperature of above 20 ° C and high relative humidity of about 80%. Monthly rainfall is often above 200 mm.

Main climate characteristics whose impact is critical for bioclimatic design are:

1) Solar radiation - it is electromagnetic radiation emitted by the sun and at the same time the most important and almost sole source of heat the atmosphere. intensity of solar radiation depends on the angle under which the beam down to the earth, and the thickness of the air layer through which the rays pass as determined by rotation of the earth, and its axis of inclination of the plane of the rotation, as well as the state of the atmosphere due to the contamination and cloudiness. The thickness of the air layer through which rays penetrate depends on the angle of the sun above the horizon (the height of the Sun) and altitude locations. The height of the sun varies with latitude, from the peak in the tropics, decreasing towards the poles. By passage through an atmosphere of solar radiation is being reflected, scattered, and absorbed so that the total amount of solar radiation that comes to the boundary of the atmosphere, only about 50% of the Earth's surface gets

2) The air temperature - low temperature during the day occur just prior to the rising of the sun, when it reached the highest level of cooling the earth's surface. The highest temperatures occur in the afternoon. Daily changes in temperature are heavily dependent on local conditions. In relation to the environment, a town

formed an island with a much warmer and drier climate.

3) Humidity - value of the air humidity or the content of water vapor in air, is usually expressed by the relative humidity. However, in order to obtain a realistic picture of the impact of moisture on the climate, it is necessary to consider other parameters that are related to the humidity: the impact of wind, fog, sultriness.

4) sultriness - sultriness the period in which it appears unfavorable combination of high temperature and high humidity, such a combination of conditions is perceived as very unpleasant by making it difficult adjustment of the external conditions (difficulty sweating, reduces the possibility of heat loss).

5) Rainfall - impact of urban areas on the climate is reflected in the thermal convection, the surface roughness of the city and the formation of condensation nuclei which subsequently due to the atmosphere. Large cities, in addition, affect the distribution of precipitation.

6) Wind - Wind is a horizontal or nearly horizontal airflow. It is usual that the wind speed and its direction is determined at a height of 10m above the free field. Characteristics of wind to a particular location may not match the data obtained from the nearest meteorological station. Local conditions such as topography and urban structures can significantly alter the speed and direction of the wind. The climate of the village wind affected in different ways throughout the year wind ventilates settlement reduces the sultriness years, yields the impression of refreshment (up to a certain speed), in winter, regardless of the measured temperature, cooled settlement and increases heat loss.

7) The duration of isolation and cloudiness - site characteristics in terms of sun can be seen through the insulation and the characteristics of clouds. Under the duration of insulation means the number of hours of sunshine in a particular location. Sunny days depends on the latitude, relief and clouds. The characteristic cloudiness is defined via the number of days with cloud cover certain values, or how many tens of heaven at the moment of observation clouded:

- clear day - average daily cloudiness is lower or equal to 2/10,

- overcast day - mean daily cloudiness is greater than or equal to 8/10.

3. PRINCIPLES OF URBAN PLANNING BUILDINGS BIOCLIMATIC AND ECOLOGICAL ARCHITECTURE

"As a result of" green design ", there was a" smart house ". From the aspect of sustainable energy it uses most accessible and renewable energy. For us, it would be geothermal water, wind energy and solar energy, accumulates and conserves energy, integrates and combines energy systems, program control rationalize consumption, saves water, rainwater accumulates, recalculated water, control air quality in the home and the level of harmful emissions from home. "

The selection and site planning depends on several influencing factors, namely:

1. FORMS OF LOCATION - most advantageous location is a rectangle with the narrow side of the north-south direction and around the side of the east-west. This form of location fits most streets are set in an ideal east-west. Facilities are being developed along the east-west axis, to

which greater surface area exposed to the sun and collect energy in a passive way.

2. CONFIGURATION - has a pronounced impact on the organization of the urban plan, building density and largely determines the microclimate, especially the temperature level, the direction and speed of wind. Due to the configuration of the field often lead to the microclimatic variations a single location in relation to the surroundings, a positive or a negative sense ▪ several tens of meters in height or hundreds of meters to the side may form a huge difference in the microclimatic conditions ▪ in the valleys and unprotected positions in the top of the hill, the average temperature, as a rule, are lower in a south facing more than in the nearby area.

3. ORIENTATION - optimal orientation of the building is one of the important factors that are at the stage of urban planning creates conditions for rational use of energy. Objectives optimal orientation: bringing to the maximum solar accumulation during the winter, minimizing overheating in the summer. Proper assessment of bioclimatic conditions of insulation is very important, because it affects the project for the building - the orientation of the rooms, room depth. Solar radiation falling on vertical surfaces and duration of insulation premises affect the economy works.

4. EXPOSURE TO WIND - during the summer wind has a favorable impact cooling effect and reduces the need for artificial ventilation. In other periods of the year, especially during the heating season, significantly increases heat loss due to higher speed and increased infiltration through the openings and the building envelope.

Ideal location in relation to the wind, the slope facing south, so natural relief location provides protection from north winds, with simultaneous exposure to the sun. Natural or artificial protection from the wind residential areas creates favorable microclimate conditions and real opportunities to reduce energy consumption for heating the building. Exist a number of ways that the objects of windshield: the construction of walls, buildings grouping in a compact unit, to configure the position of the building which acts as a windscreen for the other objects which follow in a row, the corresponding planting trees, and undergrowth.

5. VEGETATION has multiplier effects, namely: climate impact, the impact on the temperature, as well as protection from the sun, as a protection against wind, areas with vegetation creates favorable microclimate - temperature, humidity and less wind effect. The temperature of the air above the road surfaces and can be 3 - 4 ° C higher than the temperature above the grass surfaces, while the impact of these changes on the tree is much higher than that of the pot. Soil moisture and air under the trees is higher than the surrounding area. Green roofs reduce air temperature, retain dust particles and regulate a constant temperature inside the building. Protection from the sun on the south side of the building can be achieved by the trees that were planted along the facade or the arrangement of greenery in the form of horizontal cover. Shading windows facing east and west can be achieved by vertical barriers such as trees. Deciduous trees in winter, when the leaves fall, allows the sun's rays through the branches to smoothly penetrate into the interior of the building, a

year ago gives a strong shadow. Trees are the best natural protection from the wind. During the winter, the trees act as a barrier, reducing the speed of the wind and cold air infiltration into the building.

6. BUILDING RELATIONSHIPS - the level of isolation of the building affected by the existence of the surrounding buildings, passive solar facilities be located so that their south facade or surface that absorbs energy, never be in the shadow of other buildings, this requirement is met when the subject is off in the shadow of the existing buildings on the day of the winter solstice, when the sun's rays fall below the minimum angle and form the largest shadow. Options for reducing the distance between buildings north object is away from the southern neighbor of 3.85H to the solstice day was sunny, adjusting the pitch of the roof angle of descent of the solar irradiation distance is reduced, forming an asymmetrical profile of the street, near the southern facility reduces the number of floors and in the north increases, while the number of housing units remains the same, the width of the southern facility increases, the ground floor next to the housing receives other amenities, burying the southern facility reduces its height and thus the distance between the northern facility.

4. ECONOMIC APPROACH BIOCLIMATIC ARCHITECTURE - SPECIFICS OF ENVIRONMENTAL TAX

“The attribute "smart" office building gets its parameters by adjusting the external environment and the entire organization with employees and customers who spend time in it. The need for automating business residential facilities primarily is resulting from efforts to save energy, given that about 45% of our world's energy is consumed by administration in commercial and residential buildings.

The necessary investment is about 2% of the total investment, and the first results saving and cost reductions are visible after a few months.”¹

Ecological taxes may determine as taxes whose base the calculation process or a physical product units that have a negative impact on the environment, so-called. Negative externality (2). Fiscal revenue collected in this manner is exclusively intended to protect the environment and funding projects related to activities related to the protection of the environment (3). Modern fiscal policy next environmental taxes (environmental taxes) identifies three specific forms such as: taxes on energy (energy taxes, including CO₂) and fuel for transportation, taxes on transport (transport taxes) of gas), and taxes on pollution and resources (pollution and resource taxes) (3), hereinafter referred to as EETP. Four specific types of taxes apply to those products, and contamination of the resources, wherein the environmental taxes is a broader concept, which applies also to the production processes that result in the creation of negative externalities. The savings once taxes are an important form of neutralizing the negative externalities. For the production of which causes the formation of externalities, characterized by the existence of differences between the public (the costs incurred in the environment) and the private costs (cost of manufacturer) (4). The term external effects or externalities, was first used theorist welfare economics Artur Pig (5), and by which the basic theory of externalities standards. Taking into account the shortcomings of the market mechanism, he presented a thesis on the necessity of the

economic role of government intervention. According to the Pig, the state should ensure that market prices reflect the full social cost. In order to avoid transmission of economic costs on society, it is necessary to turn pollution into the price of products or activities that cause pollution or internalization of external effects (6). Ecological taxes in the EU27 region are encouraging and important fiscal role. Their collection of states achieve significant fiscal revenues. Expressed as a percentage of GDP environmental taxes had values between 2.7% and 2.8% in the period 2000-2004. years. From 2004-2008. The revenue from these taxes has continued intensive downward trend. This process was first started in the Euro region to be later extended to all members of the European Union. Since 2009, revenues from environmental taxes gradually begin to grow. Currently there is no difference between this type of revenue in the NMS-122 and EU-153 Member States. Higher energy intensity of the economy NMS-12 countries, the impact on revenue growth from environmental tax and neutralize the lower revenues collected from excise taxes (7).

5. IMPROVING ENERGY EFFICIENCY IS A WISE CHOICE

A large number of institutions in recent years has significantly changed and improved its operations, taking into account the fact that the less negative impact on the environment. Thus, their example has shown that investments in energy efficiency and environmental protection multiple payments, as well as investing in such solutions are not economically unjustified and part of a modern trend. Improving the energy efficiency theme that every year becomes more and more prominent in Serbia and it rightfully.

¹ Đurić, S., & Mihajlović, M. (2017). Economy 'smart buildings' housing. *Journal of Process Management. New Technologies*, 5(1), 1-6.

The reason for this is the fact that an increasing number of people in Serbia understand what are the real benefits of investing in EE solutions, and is today one of the simplest and most cost effective ways to improve your comfort of life, but also that its production make it cheaper and more competitive on market. The media continuously emphasizes the importance of investing in energy-efficient solutions. Why is this theme so important? In Serbia, a decade ago began an intense promotion and support in the financing of energy efficient solutions. In the previous period in this field we achieved excellent results and a large number of companies, many agricultural manufacturers and citizens so far the country with the help of banks approved and paid several hundred million loan intended precisely investments in energy-efficient solutions, as well as in renewable energy and other environmental protection measures. Specifically, programs that have the banks in the area of energy efficiency increase related to the creation of credit offers aimed at all citizens, businessmen and farmers who are interested in the different investments and improvements to your home or production provide significant savings and at the same time improve the conditions of life and work. Thanks to loans for improvement of energy efficiency and renewable energy, our entrepreneurs have the opportunity to under very favorable conditions to improve their productivity, lower costs per unit of product, but also due to lower fuel consumption and provide significant savings. It is these benefits are the reasons why we're improving the energy efficiency represent a wise choice and solution that fully repays itself. These loans by domestic companies and entrepreneurs can finance the purchase of energy-efficient machines

and equipment, to invest in their systems for heating and cooling, insulation installation, reconstruction lighting and even to invest in all projects that will result in lower energy consumption and lower emissions of carbon dioxide. Also, there are also green investment loans, which are intended for citizens and thanks to which customers can under very favorable conditions to set up thermal insulation in your home, replacement windows and doors, introduce or modernize the heating system and buy energy-efficient home appliances or white goods. Of course, there is the application of modern solutions such as installing solar panels or the installation of heat pumps, and represent a significant innovation and our mortgage loans for the purchase of new energy-efficient housing, which is characterized by extremely favorable interest rates. In addition to financial support, the government and the bank provides its customers with professional and practical recommendations and detailed estimates of the extent to which the planned investments to reduce their monthly bills and in which period, thanks to cost savings, these investments pay themselves. Many financial institutions offer in its portfolio and to have the ECO segment. This is about the segment and investments that support the bank, and which are known to contribute to the preservation of the environment and, in turn, its advancement. These include investments in production equipment and machines, solar power, biogas plants, as well as many other solutions that are environmentally justified and that the bank not only financial support, but also promoted intensively.

Generally speaking, the investments in each bank can be qualified as green if the client provides at least 20% saving in energy and / or carbon dioxide emissions, and when they have a positive effect on the soil, water and air (eg. Organic agriculture, water treatment and etc.)

It's very important to explain what it really means "green financing" and which includes all areas? The "green financing" is the name for a concept that is in financial literature and practice has long been used in its operations. Here it comes to promotion and financial support of investments that contribute to improving energy efficiency, use of renewable energy sources, as well as investments that contribute to environmental protection. In this respect, the concept of "green financing" includes three relatively different areas and to finance energy-efficient solutions, funding and support investments in renewable energy, and support environmental projects. In fact, all three areas are equally important. Any investment in any of these three areas contributes significantly to the preservation of the middle any investment in any of these three areas contributes significantly to the preservation of the environment in which we live and work, and very often their impacts significantly overlap. Studies have shown that the previously approved and paid out the largest number of loans specifically for projects to improve energy efficiency, and then almost as following loans aimed at investments in renewable energy and environmental projects are justified.

In the world and in our country, is increasingly fostering high standards in terms of business impact on the environment. Our national commitment to

the environment and improving energy efficiency does not stop only on the financing of projects and approval of loans to clients who are planning to make some progress in these areas. In fact, our country has in recent years significantly changed and improved its own business, just making sure that as little negative impact on the environment in which we live and work. Because of this, many companies have significantly modified and changed their business. Invests in LED lighting, efficient air conditioning, acquired a growing number of fully electric cars and they are replaced with standard cars that consume gasoline and diesel. As a confirmation of the correct way to protect the environment, many companies align their business with the international standard ISO 14001: 2015 (Environmental Management System) and thus become institutions that certify the system for environmental management.

Our desire is to show that investments in energy efficiency and environmental protection multiple payments, as well as investing in such solutions are not economically unjustified and part of a modern trend. It is inspiring an increasing number of companies and manufacturers in Serbia is considering investments in energy efficiency, renewable energy and environmentally justifiable solutions. For investment in these projects has a lot of space and potential in our country and we are confident that Serbia will in the years to further exploit its potentials that exist in this area.

6. FROM HOT WATER ELECTRICITY - CLIMEON OCEAN SYSTEM OF PRODUCTION 100% GREEN ELECTRICITY

Bearing in mind that 50% of world energy is released as heat, they offer solutions that part of that energy into a profitable business concept, thereby drastically reducing the emission of CO₂ into the atmosphere. It has already been shown for the regional market revolutionary system of manufacture 100% green energy recuperation of thermal energy from waste hot water. For the production of 100% green electricity can be used water from the cooling process any branch of industry, power plants, geothermal sources, and various other "manufacturers" of hot water. The plant can also be used on large ships instead of marine aggregates and realize savings in fuel, which is measured in the hundreds of thousands per annum. QUICK RAČUNICA: Production capacity of 150 kW = 1,314 MWh of green energy per year = 100% clean energy from heat = 900 tons of emissions of CO₂ savings per year plant as a strength of 150 kW to tens of MW, easily foldable, modular and made of environmentally friendly materials.

Many companies are open every day and improve their business approach, excellent sales gamut and original design solutions for all industries and offers the customers a unique "turnkey" experience in the field of eco-efficiency. The solutions offered to clients are related to long-term savings while preserving our planet, all with care and a focus on health and safety.

CONCLUSION

How much is an interesting market of renewable energy sources in Serbia is the fact that every day is expanding, and there is a growing number of companies operating in this area. Moreover, the adoption of the Regulation on Renewable Energy in June 2015 opened is the way to create an attractive and sustainable market of renewable energy sources in Serbia. We believe that setting quotas wind power of 500 MW and a wise choice. However, it is not enough for Serbia to fulfill EU 20-20-20 targets, or for Serbia's energy needs. It is necessary that a new set of regulatory schemes for renewable energy sources, including increasing the quota for wind energy, is adopted. We believe that this should be one of the priorities of the new Government and the Ministry of Mining and Energy. As for hydropower, although Serbia has significant hydrological potential, only 50% of that potential is exploited. There are many attractive locations in Serbia, which considers the construction of both large and small hydropower. However, although there are existing feed-in tariffs for small hydro power plants, we are concerned when it comes to economic justification for the construction of large hydropower projects because of the low market price of electricity by which the energy that is produced in these plants were sold. Therefore, we believe that Serbia should focus on the extension of working life and increase the power of existing hydropower plants, which represent a significant 30% of the energy mix of the country. In terms of volume, the energy sector represents the largest market in Serbia.

In accordance with the above, Serbia wants the best technology, digital solutions and funding for the next wave of investments in renewable energy and clean energy from conventional sources. However, we will continue to be committed and other industrial sectors which are equally important, such as health and aviation. If we believe the industrial potential of Serbia, it is to be happy engagement data Serbian industrial companies. In economic terms, it is important to talk to the revenue achieved in the business. In this regard, the collection of revenue from environmental taxes in the EU was created as a result of efforts to encourage environmentally responsible business and relationship with natural resources. All EU countries have regulated these regulations on their territory, so that in practice there are significant differences when it comes to tax rate and tax collection efficiency (measured by realized income). The efforts of the EU in the future policies of environmental taxes further uniformity imposed by the need to review the efficiency of revenue collection by this basis so far.

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